DRANETZ

Operating Manual

SERIES 626
UNIVERSAL DISTURBANCE ANALYZER

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USER INFORMATION

NOTE

The 626 System is U.L. listed provided that the mainframe and all plug-ins used are U.L. listed (as indicated by a U.L. listed marking).

626 plug-ins that do not bear the U.L. listed marking are not U.L. listed. Although these plug-ins have been designed for use with the 626 and will function properly, such use will void U.L. listing of the entire 626 system.

WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

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Figure 1. Series 626 Universal Disturbance Analyzer

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MAINFRAME

1 INTRODUCTION

This manual contains operating instructions for the Model 626 Universal Disturbance Analyzer (See figure 1.) The Model 626 consists of a mainframe into which may be installed up to five plug-in modules. A wide variety of module types are available for use. Each plug-in module designed for this microprocessor-based universal-type instrument is equipped with its own software.

The mainframe provides the common functions, including power and time base, for all plug-ins; its characteristics and operation are described in this manual. Other manuals describe the different plug-ins, their characteristics and operation.

2 PURPOSE

As a Universal Disturbance Analyzer, the Model 626 may be used for many applications. For example, it monitors, measures, records and prints disturbances. Depending on the particular plug-ins installed, the instrument is capable of monitoring disturbances on single phase or 3-phase AC power lines, AC neutral power lines (with respect to earth ground), and DC lines. The Model 626 may also be used as a sequence of events recorder, recording and printing out any changes of state detected at its inputs. Details of these and other specific functions of this universal instrument are presented in other manuals.

3 MAINFRAME DESCRIPTION

3.1 Front Panel

The front panel of the Model 626 contains all operating controls and indicators, regardless of the particular plug-ins installed in the unit. The two horizontal groups of pushbutton switches, as well as the FUNCTION and PRINTOUT MODE switches, perform basically mainframe functions, with some variations controlled by the particular plug-ins installed. The numeric keyboard is used for both mainframe and module functions while the two left-side groups of switches are module related. To simplify programming, indicators adjacent to the three centrally located switch groups are used to cue the operator. During the interactive programming sequence, the indicators light when switches should be depressed and go out one by one as the operator makes his selections. A thermal printer at the upper right corner of the instrument furnishes an onboard printout of data. The paper supply is accessible behind a hinged cover below the printer. The high speed printout, at 2-1/2 lines per second, may be switched off at will by the operator, although disturbance data continues to be measured and stored.

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Since the Model 626 is equipped with an RS232C interface, data may still be transferred to a remote printer or peripheral device. Baud rate may be set by the user to maintain compatibility with the remote equipment.

When the paper supply becomes low, a PAPER LOW message is printed and the thermal printer is automatically turned off to conserve paper. However, a daily summary of disturbance data accumulated during the previous 24-hour interval is printed automatically at midnight.

3.2 Real Time Clock

A crystal controlled (+25 PPM stability) real time clock in the mainframe is used as the source of time printouts. Time may be easily set by the operator, using the front panel facilities.

3.3 Audible Alarm

When the alarm circuits within the mainframe are enabled by the operator, a 1-second audible alarm sounds each time a disturbance or event change is detected (depending on modules installed). A pair of normally open dry contacts, accessible on a rear panel connector, may be used to activate a remote alarm.

3.4 Power Supply

A power supply module plugged into the rear of the instrument furnishes the power required for the mainframe and plug-in modules. (See figure 2.) The power supply may be operated from either 115 VAC or 230 VAC; a 115V/230V switch, located on its rear panel, selects the desired line voltage. (See paragraph 10 for instructions.) A 3-ampere fuse on this panel provides overload protection for either line voltage.

3.5 Battery Pack

An on-board battery pack in the mainframe, a standard feature, provides 10 to 40 minutes of uninterrupted operation if line power should fail. To increase back-up time, an external 12V battery source may be plugged into a connector on the power supply. However, the Model 626 will not operate from this source unless it is initialized by the AC line.

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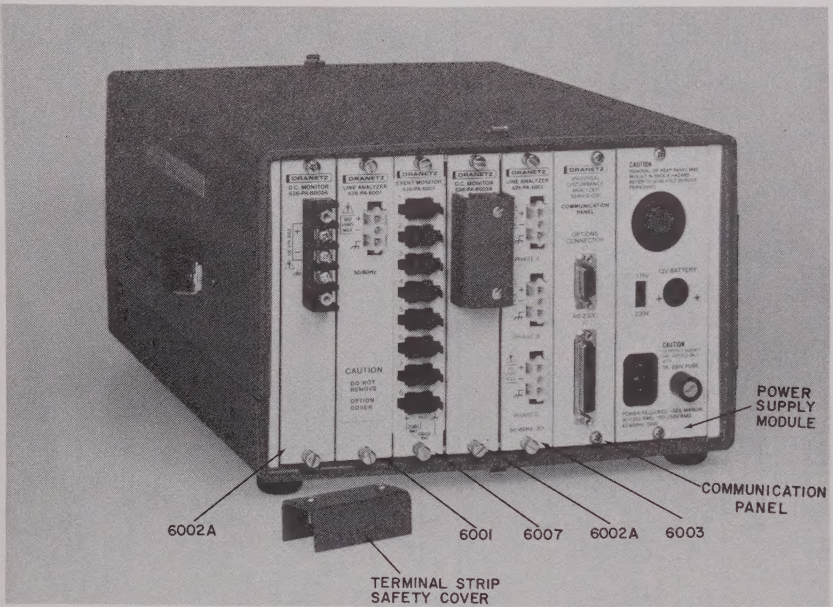

Figure 2. Series 626 Universal Disturbance Analyzer, Rear View

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3.6 Communications Panel

The Communications Panel, mounted adjacent to the power supply module, contains options connector J1 and an RS232C connector J2.

3.6.1 Options Connector J1

The options pinout is shown in Table 1. The alarm contacts, described in para. 3.3, are rated at 25 volts, 100 mA max. A second set of normally open contacts are undesignated at this printing. The time mark connections are provided as a standard feature. A DC voltage (para. 12b) applied to these contacts produces a time mark along with printout of time. This feature enables the user to correlate an external event in time. Resolution of the time mark is 10 mSec. The isolated field contact supply (Option 102), rated at 5V DC with a 5K source impedance, is available for use with the 626-PA-6007 and 626-PA-6011 to enable activation from a dry contact.

Table 1. Options Connector J1 Pinout

Pin No.	Function
1	Alarm contact 1
2	Relay contact 2*
3	Time mark (-)
4	Field Contact Supply (-)
5	
6	Alarm contact
7	Relay contact 2*
8	Time mark (+)
9	Field Contact Supply (+)

---

*Undesignated

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3.6.2 RS232 Port - Physical Description

Connector J2 provides an RS232C compatible communications port for remote printout and control of the 626. The port is configured as a DCE (Data Communications Equipment), with a drive capability of approximately 50 feet. The definition and operation of each pin of the 25-pin female "D" connector (J2) used by the 626 is described in Table 2. Note that the RS232C signal definitions are as viewed from a DTE, or the device connected to the 626.

Table 2. RS232C Port Pinout Description

PIN	NAME	FUNCTION	DIRECTION	DESCRIPTION OF OPERATION
1	GND	Protective Gnd.	n/a	Shield of interface cable should be connected to this pin which is tied to frame ground internally in the 626.
2	XMT	Transmit Data	To 626	Serial data output from the connected device is sent to the 626. RTS and DTR must be TRUE for data to be recognized.
3	RCV	Receive Data	From 626	Serial data outputted by the 626 to the connected device, provided DTR and RTS are TRUE.
4	RTS	Request to Send	To 626	This signal must be TRUE for the 626 to recognize the presence of connected device. A FALSE state of more than 240 msec will cause the RS232 PORT LOST message to be printed and appropriate action taken.
5	CTS	Clear to Send	From 626	This signal will be TRUE as long as the ACIA and driver circuitry of the RS232C port of the 626 are operational.
6	DSR	Data Set Ready	From 626	Same as CTS.
7	GND	Signal Ground	n/a	Internally connected in the 626 to pin 1.
8	DCD	Carrier Detect	n/u	Not used or provided by the 626. For devices requiring this signal to be TRUE, jumper pin 8 to pin 6 or 5.

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Table 2. RS232C Port Pinout Description (Cont'd)

PIN	NAME	FUNCTION	DIRECTION	DESCRIPTION OF OPERATION
15	XCLK	DCE Xmt Clock	From 626	Xmit clock of data outputted by the 626. Frequency = 16 x Baud rate.
17	RCLK	DCE Rcv Clock	From 626	Receive clock of data into the 626. Internally jumpered in the 626 to XCLK and DTE Xmit Clock. Hence, Xmit and Receive Baud rates must be the same.
20	DTR	Data Term. Ready	To 626	This signal must be TRUE for the 626 to acknowledge presence of connected device. FALSE state causes immediate disabling of port.

3.6.3 Dranetz RS232C Interconnect Cable

Connection of the Model 626 to a CRT terminal or teletypewriter may be made with a Dranetz RS232C cable (Dranetz Part #103506). (See figure 3.). The cable ties pins 4 and 20 internally to simplify connection to a terminal, and requires only a logic high signal to be fed to pin 20 (DTR).

3.6.4 Data Format

Data transmitted from and received by the 626 via the RS232C port should be 11 bit ASCII format serial data. The exact format is as follows:

1 Start Bit / 7 Bits of Data / 1 Parity Bit (Even) / 2 Stop Bits

Devices that require only 1 stop bit on received data should function properly even with the 2 stop bits (second one is ignored). For characters sent to the 626 by a human operator, 1 stop bit is sufficient since the time between characters will easily exceed 1 stop bit's duration. However, if the data is being sent by a high speed device (such as a computer), sufficient time between characters should be provided for, to prevent framing errors from occurring. Note: Such errors may result in misinterpretation of data.

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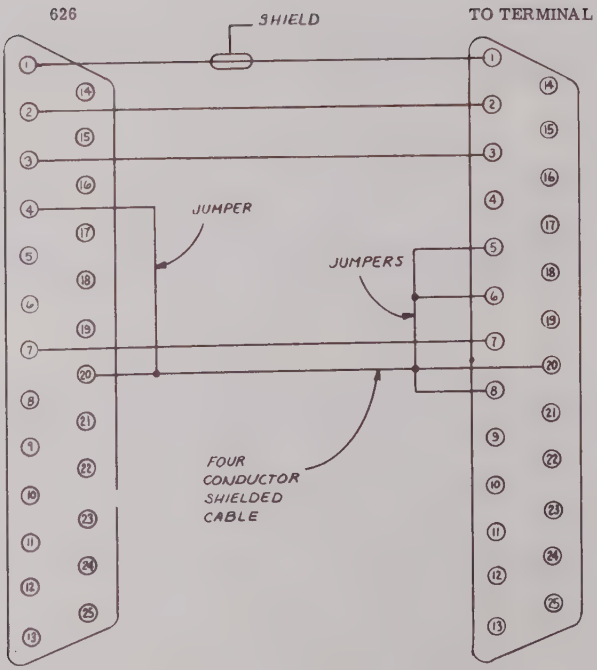

Figure 3. RS232C Interconnect Cable

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The baud rate is selectable from 110 to 9600 by switching S1 on the A2 board (See Maintenance Manual, Volume 2 of TM-106650U). Higher baud rates (up to 19,200) are possible, but not advisable. The baud rate is factory preset to 300. Xmit and Receive baud rates must be identical.

NOTE: Disturbance data and other printouts from the 626 contain EOT (ASCII 04) characters within and throughout the messages (unless the data is received via the 626-PA-6012, which strips out extraneous control characters). For devices that have an auto-disconnect feature on EOT, this feature should be disabled to prevent problems from occurring.

3.6.5 Operation of RS-232 Port and Printer

The 626 mainframe comes equipped with a "SMART" RS-232 port. Upon powering up the unit, the RS-232 control lines are interrogated to determine the existence of a functional remote device (i.e. teletype, video terminal, etc.). If this test fails for any reason, the normal POWER ON messages (see par 5.1) will be accompanied by an additional "RS-232 LOST" message and time printout. In this state, disabling the printer is not permitted. Thereafter, attempting to push the PRINT pushbutton will cause the following message to be printed:

```
10/14/83   13:15:47          ↑
     RS232 LOST              |   Read Up
     PRINTER ON              |
```

(Note: the unit "powers up" in the PRINTER ON mode).

If at any time thereafter, the RS-232 control lines are satisfied, a message: "RS232 RESTORED" and time/date will be printed, and normal operation will be restored.

If, during normal operation, the RS-232 control lines become invalid, the "RS-232 LOST" message and time/date will be printed. The unit is then forced into the "PRINTER ON" mode. The unit will, however, "REMEMBER" the last status of the printer, and upon restoration of proper RS-232 operation, print "RS-232 RESTORED" and time/date. It will then restore the previous status of the printer and print "PRINTER OFF" and time/date if applicable.

The "RS-232 LOST" message will be accompanied by a "PRINTER OFF" message only if the printer was off at the time.

The "RS-232 RESTORED " message will be accompanied by a "PRINTER OFF" message only if the printer was off at the time of the "RS-232 LOST" message.

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3.6.6 Remote Operation

On the 626's delivered prior to October 1, 1982, a remote device connected to the RS-232C port may request execution of three sequences. The remote commands, which may be entered from a terminal are P (to produce a PROGRAM SUMMARY), D (for a DATA SUMMARY), and C (for a SYSTEM CHECK).

The command character will be printed in column 1 on the 626 paper tape and/or any remote display device. Invalid characters are echoed with a "?".

626's delivered after October 1, 1982 can be fully operated in either LOCAL or REMOTE ONLY MODE.

3.6.6.1 Local Mode

When the 626 is turned on, it will start in LOCAL MODE. In this mode, the 626 responds ONLY to commands entered from its front panel and ignores inputs received through its RS-232C port, with one exception: the tilde (~) character. Each time this character is received, the 626 will toggle between LOCAL and REMOTE ONLY MODE.

3.6.6.2 Remote Only Mode

When placed in REMOTE ONLY MODE, the 626 will respond only to commands received through its RS-232C interface. The only exceptions are the "ON" and "RESET" positions of the FUNCTION switch. As shown in Table 3, an ASCII character has been set equivalent to each front panel push-button or switch position (except "OFF" and "RESET"). For operator convenience, a pull-out tabbed card with all remote commands is supplied in this manual.

3.6.6.3 Using the Thermal Printer as a Line Printer

The thermal printers on units delivered after October 1, 1982 can be made to function as line printers by executing the following ASCII commands:

~ (Tilde): Puts 626 in REMOTE ONLY mode

{ (Open Brace): Puts 626 in LINE PRINTER mode

} (Close Brace):Takes 626 out of LINE PRINTER mode

When used as a line printer, the 626 will print all data received via its RS232C port. The data is not echoed back to the source. Printing is in 20 columns, with a carriage return automatically generated after the 20th column.

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Table 3. 626 Remote Commands

(Valid ONLY in REMOTE ONLY Mode)

Front Panel Control Function Switch	Equivalent ASCII COMMAND	Front Panel Control Programming Pushbuttons	Equivalent ASCII COMMAND
OFF	None-Local Only	RANGE	R
OPERATE	O	INPUT	J
PROGRAM	G	ENTER	E
CLEAR DATA	K	LO LIMIT	L
RESET	None-Local Only	HI LIMIT	H
PRINTOUT MODE Switch		SENS	S
SUMMARY ONLY	M	IMP SENS	I
OUT-OF-LIMITS ONLY	U	F SENS	F
NORMAL	N	FNC (Function)	<
MAXIMUM DETAIL	X	Ø-9 (Yellow Pushbuttons)	Ø-9
CALIBRATE (System Check)	C	•: (Decimal Point)	•
Upper Pushbuttons		•: (Colon)	:
ALARM	Q(To turn OFF or to A turn ON)	CLEAR ENTRY	Delete
		LOWER PUSHBUTTONS	
PRINTER	Z	Clock	/ (Slash)
PRESET	T	1 (CH 1)	a
DATA	D	2 (CH 2)	b
PROG	P	3 (CH 3)	c
FEED	(Space)	4 (CH 4)	d
		5 (CH 5)	e

Special Command	
REMOTE/LOCAL MODE Selection	~ (Tilde Alternately selects REMOTE ONLY and LOCAL modes

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Table 3. 626 Remote Commands

(Valid ONLY in REMOTE ONLY Mode)

Front Panel Control Function Switch	Equivalent ASCII COMMAND	Front Panel Control Programming Pushbuttons	Equivalent ASCII COMMAND
OFF	None-Local Only	RANGE	R
OPERATE	O	INPUT	J
PROGRAM	G	ENTER	E
CLEAR DATA	K	LO LIMIT	L
RESET	None-Local Only	HI LIMIT	H
PRINTOUT MODE Switch		SENS	S
SUMMARY ONLY	M	IMP SENS	I
OUT-OF-LIMITS ONLY	U	F SENS	F
NORMAL	N	FNC (Function)	<
MAXIMUM DETAIL	X	Ø-9 (Yellow Pushbuttons)	Ø-9
CALIBRATE (System Check)	C	•:• (Decimal Point)	•
Upper Pushbuttons		•:• (Colon)	:
ALARM	Q(To turn OFF or to A turn ON)	CLEAR ENTRY	Delete
		LOWER PUSHBUTTONS	
PRINTER	Z	Clock	/ (Slash)
PRESET	T	1 (CH 1)	a
DATA	D	2 (CH 2)	b
PROG	P	3 (CH 3)	c
FEED	(Space)	4 (CH 4)	d
		5 (CH 5)	e

Special Command
REMOTE/LOCAL MODE Selection ~ (Tilde Alternately selects REMOTE ONLY and LOCAL modes

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4 OPERATING CONTROLS (See figure 4)

The functions of those operating controls primarily concerned with mainframe operation (i.e., used with all plug-in types) are described in Table 4. Where a control function varies when operating with a particular plug-in type, the variation is described in the manual covering that plug-in. Since some pushbuttons are included only for use with certain plug-in modules, they are described in other manuals, in conjunction with the associated modules.

Table 4. Mainframe Controls

Item	Function
ALARM pushbutton	When depressed to "in" position, enables alarm circuit.*
PRINT pushbutton	A momentary pushbutton which alternately enables or disables the thermal printer. With each depression of this pushbutton, the printer will echo either "PRINTER ON" and time/date, or "PRINTER OFF" and time/date. In the latter case, further printout is inhibited unless one of the following occurs: 1. Power is turned off or on. 2. End of day produces daily accumulated summary. 3. RS-232 is lost. 4. Power is lost.
PRESET	(Plug-in function)
DATA pushbutton	When depressed to "in" position, and with function switch in operate position, unit prints out date, time and contents of daily accumulator in each channel (instrument slot position) in sequence (1-5).
PROG pushbutton	When depressed to "in" position, and with FUNCTION switch in OPERATE position, unit prints time/date and a summary of the program (threshold settings) in each channel in sequence (1-5).

*With some types of disturbances or event changes, this causes 1-second audible tone to sound.

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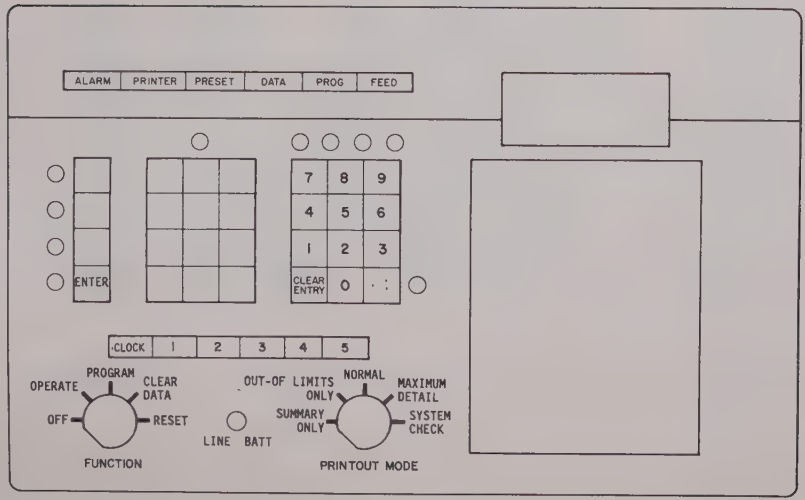

Figure 4. Mainframe Controls

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Table 4. Mainframe Controls (Cont'd.)

Item	Function
FEED pushbutton	When held in depressed position, causes paper to feed out of thermal printer.
ENTER pushbutton	When depressed, enters numeric keyboard constants into real time clock or plug-in program.
Numeric keyboard (Ø-9, ., and (CLEAR ENTRY)	Used to enter constants when setting time/date or programming.
CLOCK pushbutton	When depressed to "in" position and with FUNCTION switch in PROGRAM position, enables operator to set time and date.
1-5 pushbuttons	When depressed to "in" position, and with FUNCTION switch in PROGRAM position, selects plug-in channel for programming.
FUNCTION key switch	OFF: Turns off instrument. OPERATE: Normal operating position. Programming switches are disabled and key may be removed to prevent unauthorized use of instrument. However, top row of pushbuttons (ALARM, PRINT, etc.) may be activated. PROGRAM: enables user to program real time or thresholds of selected channel. CLEAR DATA: Clears all daily accumulators, removing all data obtained that day, but does not affect real time. RESET: Hard wire reset to central processing unit. Activates system initialization routine in the same manner as the POWER ON function. Does not reset time, date or program information.
LINE-BATT indicator	Green LINE indicator lights when AC power is present. Red BATT indicator lights when power is lost and unit is automatically switched to battery source.

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Table 4. Mainframe Controls (Cont'd.)

Item	Function
PRINTOUT MODE key switch	Printout data reduction occurs as switch is rotated ccw. Key (identical to FUNCTION switch key) may be removed in any position. SYSTEM CHECK: Puts all channels in system check mode, and printout (in sequence) is produced by self-contained calibrated signals. MAXIMUM DETAIL: Produces detailed printout (function of plug-in). NORMAL: Produces less detail (function of plug-in). OUT-OF-LIMITS ONLY: Prints disturbance data only when out of limits. SUMMARY ONLY: Printer is inhibited. All data is still loaded into daily accumulators. Provides Daily Summary at midnight.

5 MAINFRAME OPERATING PROCEDURES

5.1 Power On

With instrument plugged into AC power source, rotate FUNCTION key switch from OFF to OPERATE. The printer will provide a Power On message that shows date and time, mode of selected function and printout mode. Note: An external device is connected to the RS232 Port in this printout. If device is not connected, "RS232 LOST" message will also be printed.

Example

```
   MAXIMUM DETAIL
   OPERATE MODE
10/14/83   13:27:04
   LOCAL MODE
10/14/83   13:27:04
   POWER ON RESET
```

↑ (Read Up)

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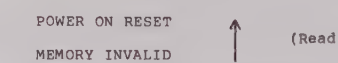
When power is applied, the instrument performs diagnostics on its own (non-volatile) internal memory which is maintained during power off intervals by the internal battery pack. Thus, the Model 626 cannot lose its program or time during power off. Each time the instrument is turned on, all modules are reinitialized to their previous programming, even after extended intervals of time. If a normal POWER ON RESET message is generated, the memory is validated.

If the self-diagnostics on the internal memory determine that the memory is invalid (e.g., if the real time board in the mainframe was replaced), the unit prints



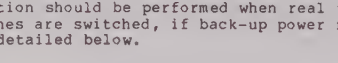
This indicates that the user must program time/date as well as the plug-in programs. Another self-diagnostics feature tests the CPU RAM. Failure would be indicated by a CPU RAM FAILED message on the printout.

5.2 Setting Date and Time

This mainframe function should be performed when real time must be reset (e.g., when time zones are switched, if back-up power fails, etc.). The procedures are detailed below.

5.2.1 Setting Date

a. Depress the CLOCK pushbutton and set the FUNCTION switch to PROGRAM. The instrument now prints the existing (old) date and time followed by an "ENTER DATE' message:



b. Note that the two right-most cueing indicators above the numeric keyboard light, indicating that two pushbuttons on the keyboard must be depressed to enter the month (indicated on the printout as "MM"). Upon entering the month, the two indicators go out and the cueing indicator adjacent to the semicolon pushbutton lights. When the semicoolon pushbutton is depressed, the same two cueing indicators above the numeric keyboard light again. This indicates that the day should now be entered ("DD" on the printout). Once again these cueing indicators go out when the day is entered and the cueing indicator adjacent to the semicolon pushbutton lights. When the semicolon pushbutton is depressed again, the two cueing indicators above the numeric keyboard light. This indicates that the year should now be entered ("YY" on the printout).

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c. After the year is entered, the indicator next to the ENTER pushbutton lights. Depress the ENTER pushbutton to register the date on the instrument. The cueing indicator turns off and a printout takes the following form:

```
ENTER TIME (HH:MM)
10/14/83   13:39:42          ↑ (Read Up)
```

5.2.2. Setting Time

a. The two rightmost cueing indicators above the numeric keyboard light again, indicating that two pushbuttons on the keyboard must be depressed to enter hours (symbolized by "HH" on the printout). Upon entering hours, the two indicators go out and the cueing indicator adjacent to the semicolon pushbutton lights. When the semicolon pushbutton is depressed, the same two cueing indicators above the numeric keyboard light again, indicating that minutes should be entered.

b. When time (both minutes and hours) has been entered, the indicator next to the ENTER pushbutton lights. Assume that it is almost 12:30:00. At precisely 12:30:00, depress the ENTER pushbutton. This enters the time and turns off the cueing indicator. The printout takes the following form:

```
(MM:DD:YY)
ENTER DATE                   ↑ (Read Up)
10/14/83   12:30:00
```

After proper time and date have been entered, the operator may disregard the ENTER DATE message and proceed to program a plug-in channel or return to OPERATE MODE.

6 GENERAL DESCRIPTION OF OTHER OPERATING PROCEDURES AND PRINTOUTS

The following information is presented to give the user an overview of the instrument's operation and to avoid excessive repetition in later sections of this manual. Although some of the printouts necessarily include specific plug-in programs and data, only details common to overall operation (with any plug-in types) are highlighted.

6.1 Program Summary

To operate a summary of the programs stored in the installed plug-ins, set FUNCTION switch to OPERATE and depress PROG pushbutton.

Example:

Three 626-PA-6001 plug-ins are installed in channels 1, 2, and 3. Channels 4 and 5 are empty. Note that the printout is identified as PROGRAM SUMMARY, time and date are furnished and each plug-in is identified by slot position and type.

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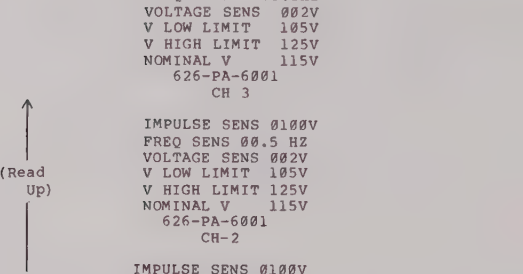

6.2 Data Summary

To obtain a summary of data, set FUNCTION switch to OPERATE and depress DATA pushbutton. The data summary provides the date, present time, present values and the total number and worst case of each type of disturbance for each channel of each plug-in.

Example:

With three 626-PA-6001 plug-ins installed in the mainframe, disturbance data recorded on channel 1 is printed out. (No data has been recorded on channels 2 and 3.)

NOTE: HT stands for "hits". The Ø02 indicates two impulse "hits" or occurrences with the largest being 377V.

```
                CH 3
                CH 2
          IMP Ø377V Ø02 HT
             626-PA-6001
                CH 1
(Read Up)   Ø2/15/84   12:43:38
             DATA SUMMARY
```

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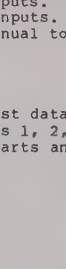
6.3 System Check

To activate a system check, which will verify the performance of the plug-in installed in the mainframe, set the PRINTOUT MODE switch to SYSTEM CHECK. This replaces the normal inputs to all plug-ins with internally generated precise test inputs. The printout then indicates the results of processing the test inputs. The test printout must then be checked against the Operator's Manual to determine the accuracy of the plug-ins.

Example:

This printout contains the test data for plug-ins installed in channels 1, 2, and 3. Note that the printout starts and ends with asterisks.



```
**********************
    PRESENT F 060.0 HZ
    PRESENT V 119.6 V
    IMP   + 0160 V PK
        CH 3
    PRESENT F 060.0 HZ
    PRESENT V 119.6 V
    IMP   + 0160 V PK
        CH 2
    PRESENT F 060.0 HZ
    PRESENT V 120.4 V
    IMP   + 0160 V PK
        CH 1
    10/14/83  15:16:43
******SYSTEMCHECK******
```

6.4 Internal Battery Pack

If an AC power failure should occur, the battery pack maintains full operation. The green LINE indicator on the front panel goes out and the red BATT indicator lights. The printer outputs a BATTERY ON message which also provides the time/date of this occurrence.

Example:

```
10/14/83   15:40:29
    BATTERY ON
```

If the output of the internal battery pack drops below operating level, a POWER LOSS message is printed, indicating that no further data may be processed. The unit is then automatically switched off. Time, date, data and program information will be valid for up to 2 weeks after power loss.

Example:

```
10/14/83   15:47:26
    POWER LOSS
```

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When line power is restored, a POWER RESTORED message is printed.

Example:

```
10/14/83   15:43:39
    POWER RESTORED
```

NOTE

The internal battery pack will recharge to full capacity in approximately 10 hours with the mainframe connected to AC lines and unit operating.

When the instrument is turned off, a POWER OFF message is printed, along with date and time.

Example:

```
10/14/83   15:45:16
    POWER OFF
```

6.5 Preset Factory Program

In the event the last program is lost, the program base for the plug-ins is automatically derived from factory-preset non-volatile memory (located in the plug-in). Standard programs are normally prepared for hard storage. As an option, user selected programs may be loaded into hard storage at the factory. The instrument reverts to the hard storage program when a MEMORY INVALID condition exists or when the operator depresses the PRESET pushbutton while in the program mode with the appropriate module selected.

6.6 Short Term Accumulator

The internal stack has the capability of handling at least 32 disturbances, more if multiple disturbances occur in a single time frame (10 mSec). Data is sent to the stack and is then printed out.

In the case where the data output cannot keep up with the data input, the stack will overflow. While the stack is full, the worst case data is sent to the Short Term Accumulator. After the Short Term Accumulator data is printed, it is cleared. The printout format is as follows:

```
IMP        0166V      014 HT
SAG        107.6V     002 HT
V LO       105.4V     001 HT

Read
Up

        626-PA-6001
            CH4
        SUMMARY MODE
```

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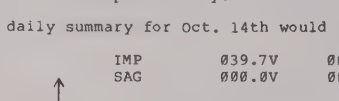
6.7 Daily Summary

When the real time clock reaches 23:59:59.59, presumably at midnight, it will reset to 00:00:00.00 and print a daily summary which will consist of all the accumulated data of that day and then reset to begin accumulation for the present day.

The daily summary for Oct. 14th would read as follows:



7 INSTALLATION OF PAPER TAPE

The instrument is shipped with a roll of paper already installed. During operation, when the paper supply becomes low, the unit will automatically print

SUMMARY ONLY

PAPER LOW

and operation will be shifted to the SUMMARY ONLY mode (regardless of the PRINTOUT MODE setting), indicating that the paper roll should be replaced. After the paper is replaced, the unit reverts back to the setting of the PRINTOUT MODE switch.

NOTE

In the SUMMARY ONLY mode, normal printout of disturbance data is inhibited and only the daily accumulated summary is produced. Therefore, if it is anticipated that a large number of disturbances will occur during a period of unattended operation, do not wait for a PAPER LOW condition - install a full roll of paper.

Before replacing the thermally sensitive paper, clean the printhead as described in paragraph 8. After cleaning the printhead, replace the paper roll as follows:

a. Pull two black cover latches to lower cover.

b. Tear paper roll just above old roll. Do not remove remaining paper from printer.

c. Push two spring paper holders outward to release old paper roll and remove roll.

d. Remove holding tab from new paper roll to release end of roll. Use a scissors to cut edge of the paper straight.

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e. Holding the paper roll so that it unrolls, expand the two spring paper holders, install the roll, then release the holders to lock the roll in place.

NOTE

If there is no paper in printer, proceed directly to step i.

f. Ensuring that the new paper is aligned correctly to avoid jamming, insert the cut end between the rubber roller and the remaining old paper so that the old and new paper overlap.

g. Depress and hold FEED pushbutton until the new paper comes into view and the old paper is completely out of the printer.

h. Raise cover and guide paper through opening, then lock cover in place.

NOTE

Proceed with the following steps only if there is no paper in printer.

CAUTION

BE SURE THAT HANDS ARE CLEAN. ANY GREASE OR FOREIGN MATTER ON HANDS MAY CONTAMINATE ROLLER AND CAUSE PRINTER TO MALFUNCTION.

i. Using one hand, feed the cut end of the new paper between the rubber roller and the feed chute opening under the printer. Using the thumb on the other hand, gently rotate rubber roller in the forward direction until the paper comes into view.

j. Depress and hold FEED pushbutton to ascertain that paper moves smoothly. If not, repeat procedure to step i.

k. Raise cover, guide paper tape through opening, then lock cover in place.

NOTE

Due to the coiling action of the paper on its spool, it is likely that repetitive printouts of the PAPER LOW message will occur until the paper supply is clearly below the triggering point of the optical paper sensors. This occurrence is intentional and should not be a cause for concern.

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8 CLEANING PRINTHEAD

During the course of normal printer operation, minute particles of thermal sensitive material tend to be dislodged from the surface of the printer paper. These particles accumulate on the surface of the heating matrix in the printhead. This causes a reduction in heat-flow to the paper, causing the following symptoms:

Print density too light
No printout
Missing dots

To clean the printhead in the simplest and preferred method, particles may be removed by inserting a length of bond paper (approximately 10 inches in length cut to width of 2.25 inches) into the printer and operating the printer by pressing the FEED button until the length of paper passes through the printer. Insert this paper in the same manner as if replacing the paper roll.

NOTE

For your convenience Dranetz has made available a precut paper roll (Dranetz P/N 103418). This paper serves as an abrasive which buffs the surface of the printhead clean. It is recommended good practice to clean the printhead each time the thermal sensitive paper roll is replaced.

9 BAUD RATE

The baud rate is factory set at 300. Please refer to the service manual (Vol. 2 of TM-106650U) for setup of additional baud rates.

10 POWER SUPPLY AC VOLTAGE SELECTION

A 115/230V switch on the rear panel of the Power Supply Module enables 626 operation from either 115V or 230V (nominal) AC power sources. To program this switch for the desired power line voltage, proceed as follows:

a. Set the key switch to OFF, turn off power source and disconnect power cord from unit.

b. Disconnect all measurement inputs from unit.

c. Using a small screwdriver or other suitable tool, set the 115/230V switch to the desired position.

d. For 115V operation, install AC cord (DTI P/N 104943) between unit and 115V power source.

NOTE

This power cord is a standard accessory supplied when the 626 is factory set to 115V. When operating at 230V, AC cord P/N 1107726 is mandatory.

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11 SPECIFICATION SUMMARY

Table 5 summarizes the specifications of the Model 626 mainframe.

Table 5. Specification Summary

Plug-in Module Capacity	1 through 5
Time Clock	Crystal controlled, +25 PPM Keyboard entry (approx.) ± 2 sec/day)
Alarm Circuits (Activated by any printable disturbance)	1. Audible alarm, 1 second self-cleaning, keyboard selectable 2. Alarm Contact closure
Temperature Range	
Operating	+10 to +40° C
Storage	-40 to +55° C
Power Requirements	90-130V rms or 180-250V rms at 47 to 450 Hz, 50W nom. +12 VDC @ 3 Amps nom.
UPS Capacity	10 to 40 minute operation on internal battery pack. 6-10 hr. recharge time.
Size	7" high x 11" wide x 14" deep
Data Output	Onboard thermal printer. RS232C Interface with control capability.

12 FEATURES

a. Factory preset program

b. Time Mark: Includes optical coupled time mark circuit which causes Model 626 to print a time mark when externally supplied DC voltage appears at the rear panel options connector. The time mark is useful in providing time correlation with an external event.

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Specifications

Input Voltage	5 to 12V DC
Input Current	4 mA @ 5V typical 22 mA @ 12V typical
Timing of applied voltage	Operates on leading edge
Pulse Width	100 uSec minimum
Pulse Rate	100 per sec.
Off Period	500 uSec minimum

13 STANDARD ACCESSORIES (SHIPPED WITH ALL UNITS)

Model No.	Part No.	Quantity	Description
626/626-0-101	TM-106650U Vol I	1	Operator's Manual
	107506	1	Mating Connector for 12V Battery
	104943	1	AC Line Cord
Amp			
	205204-1 (1)		Connector Housing (Option Connector P1)
	66557-3 (9)		Pin (Option Connector P1)
	207908-1 (1)	1 Set	Hood & Cable Clamp (Option Connector P1)
	110289-1 (1)		Instruction Decal (Option Connector P1)
	102714	3	Thermal Paper
	103418	1 Set	Cleaning Paper

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14 626 MODULE CAPACITY

The 626 standard mainframe has an upper limit of the total load rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Ratings
626-PA-6001	2 Units
626-PA-6001 With Extra Option Board	3 Units
626-PA-6002	2 Units
626-PA-6003	4 Units
626-PA-6006	2 Units
626-PA-6007	1 Unit
626-PA-6008	2 Units
626-PA-6009	4 Units
626-PA-6011	1 Unit
626-PA-6012	3 Units
626-PA-6014	1 Unit
626-PA-6015	4 Units

When selecting modules for installation in any mainframe, simply verify that the sum of the load ratings of the installed modules does not exceed 20.

15 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Technologies Customer Service Department and obtain an Authorization Number.

Phone No: 201-287-3680; TWX 710-997-9553

2. Fill out the Repair/Service Order enclosed in this manual and ship it with the equipment to the Customer Service Department.

3. You have been supplied a Control Form with a Registration Number in this Operating Manual. The purpose of this form is to allow you to obtain a Maintenance Manual for your device at no charge. In the event that you have lost this document (which has been loosely inserted in this Operating Manual), please call the Dranetz Technologies Customer Service Dep't which will supply you a replacement form.

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-106705U

VOLUME 1

OPERATOR'S MANUAL

626-PA-6001

SINGLE PHASE AC MONITOR

NOTE

Refer to Volume 2 (Service Manual) of TM-110650U for maintenance data.

1 May 1984

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DRANETZ

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626-PA-6001 SINGLE PHASE AC MONITOR

1 INTRODUCTION

This manual provides instructions for the 626-PA-6001 Plug-in, hereinafter referred to as the 6001. The 6001 is designed for installation in the Model 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in TM-106650U.

2 PURPOSE

The 6001 is designed to monitor single phase AC power lines. With thresholds programmed by the user, the 6001 monitors both short and long term power line disturbances. With this plug-in, the unit stores, analyzes, classifies and prints out quantative and qualitative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The plug-in monitors any single phase power line whose RMS values range from a low value of 20 volts to as high as 600 volts, programmable in three broad ranges. Three types of disturbances are monitored by the 6001: power line frequency, power frequency transients and waveform disturbances. Power frequency transients are divided into five display categories: overvoltage, undervoltage, voltage change, voltage surge and voltage sag. Waveform disturbances, identified as "impulses," include all conditions that cause the power line waveform to deviate from an ideal waveform. The 6001 measures both the peak amplitude of impulses and their polarity. When equipped with an option board, the 6001 also measures pulse duration and direction or pulse area and direction. The threshold value of each type of disturbance, as well as the line frequency, above which detection and printout occurs, is operator programmable. Except for an automatic summary printout at the end of each day, disturbance data is normally printed out only when the disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of each day. This feature permits long term unattended operation.

The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

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3 APPLICATIONS

When installed in the 626 mainframe, the 6001 provides the capability of monitoring and evaluating power system performance. Among its typical applications are the following:

a. To determine the effect of power systems operation on equipment malfunction. The time-referenced power fault disturbance record produced by the instrument permits rapid correlation of errors, outages, and equipment damage in computer, industrial process controls, digital communications equipment, medical monitoring apparatus, and so forth, to power line faults.

b. To perform pre-installation site surveys. The 6001 can be used to determine the adequacy of existing power lines intended to support critical electrical equipment. Anticipation of power problems saves time, money, and future trouble.

c. For diagnostic evaluation of power system performance. The portable instrument, particularly well suited for field use, is ideal for determining the probable causes of, and remedies for, power line disturbances.

d. For monitoring life test racks. The printout produced by the instrument provides a clear record of the quality of power supplied during unattended periods.

4 EQUIPMENT CHARACTERISTICS

The 6001 is configured as a plug-in module 6.5" high by 1.25" wide x 10" deep. It is designed for installation in any one of the five slots of the Model 626 Universal Disturbance Analyzer. Technical specifications of the 6001 are presented in Table 1.

Table 1. 626-PA-6001 Technical Specifications

Input	2 wire differential Z_{in} = 40 Megohms plus 40 pf (each side to ground)
Full Scale Input Voltage Ranges	200V F.S. 400V F.S. 600V F.S.
Input Voltage Frequency	45 - 65 Hz
Overall Input Voltage Ranges	20 - 200 VAC 40 - 400 VAC 80 - 600 VAC

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Table 1. 626-PA-6001 Technical Specifications (Cont'd.)

Lower Limit of User-Set Voltage (1V Increments)	200V F.S. Range	20 - 199 VAC
	400V F.S. Range	40 - 398 VAC
	600V F.S. Range	80 - 596 VAC
Upper Limit of User-set Voltage	200V F.S. Range	21 - 200 VAC
	400V F.S. Range	42 - 400 VAC
	600V F.S. Range	84 - 600 VAC
Voltage Change Sensitivity (1V Increments)		
200V F.S. Range		1 - 15 volts
400V F.S. Range		2 - 30 volts
600V F.S. Range		4 - 60 volts
Line Voltage Measurement Accuracy		±1% of reading, ±0.2% of full scale at calibration frequency of 50 or 60 Hz. Additional ±1% at frqequency extremes.
Line Voltage Measurement Resolution		
200V F.S. Range		0.2 Vrms
400V F.S. Range		0.4 Vrms
600V F.S. Range		0.8 Vrms
Impulse Ranges (2 mSec to 1 uSec)		
200V F.S. Range		25 - 1000V
400V F.S. Range		50 - 2000V
600V F.S. Range		100- 4000V
Impulse Thresholds (1V Increments)		
200V F.S. Range		25 - 1000V
400V F.S. Range		50 - 2000V
600V F.S. Range		100- 4000V
Impulse Accuracy		±5% of reading ±1% F.S. for half-sinewave impulses 10 uSec in duration regardless of polarity or grounding. Error increases to ±10% of reading, ±1% F.S. at 5 uSec and 50 uSec pulse durations, and is -6 dB typ. at 2 mSec and 1 uSec pulse widths
Line Frequency		
Range		45 - 65 Hz
Resolution		±0.1 Hz
Accuracy		±0.2 Hz
Program Limits		.2 Hz to 3.0 Hz (.1 Hz Increments)

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5 INSTALLATION

To install the 6001 in the mainframe, proceed as follows:

CAUTION: Be sure 626 is turned off and that all power connected to all the plug-in modules is turned off.

a. Position the top and bottom front corners of the plug-in module in the upper and lower tracks at the desired slot position at the rear of the mainframe.

b. Carefully slide the module into the mainframe until it is firmly seated.

c. Tighten the top and bottom captive screws to secure the module to the mainframe.

6 CONNECTING POWER SOURCE TO MODULE

6.1 Connection Procedure

The 6001 is supplied with either a barrier type terminal strip under a small cover or with an AC connector located at the rear of the module. Proceed as follows:

a. Insert key in FUNCTION key switch on front panel of mainframe and set switch to OFF position.

b. Turn off AC power to the line that is to be monitored.

c. If a terminal strip is mounted on the rear panel of the 6001, remove the terminal strip safety cover to expose the connections. Now connect the single phase line to the three terminals (two AC leads to upper two terminals and earth ground to the third terminal, as marked). When all connections have been made, be sure to replace the terminal block cover, then reapply AC power.

d. If a connector is installed on the rear panel of the 6001, the AC source to be monitored should be wired to the cable assembly supplied with the module. If the supplied cable is not adequate, the mating connector can be obtained from AMP, Inc. The part numbers are as follows:

Part Number	Description
1-480700-0	Connector Housing
1-640720-0	Strain Relief
350689-1	Socket Contacts

Attach wired mating connector to the rear panel connector then reapply AC power.

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CAUTION

To avoid damaging the equipment, do not apply AC voltages in excess of 600V RMS to the 6001.

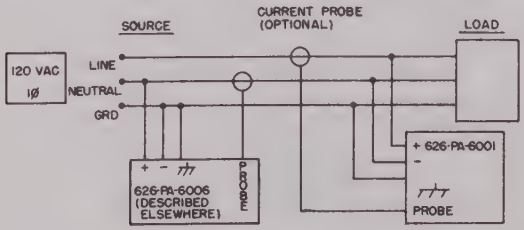
6.2 Circuit Applications

WARNING

Connection should be performed only by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18 (1 mm^2). For branch circuits with higher ampacity, refer to National Electric Code (ANSI C1-1975 Para. 2404-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

The single phase AC minitor is commonly used alone to monitor a single AC phase, line-to-neutral; or in multiples, to monitor 3Ø or split-phase sources. Note that the plug-in monitors only the voltage difference between its + or - inputs, with the input acting only as a common grounding point. The input is tied to the safety grounding conductor in the 626 power plug, so be careful not to inadvertantly contaminate a "clean" computer power ground with a "dirty" building ground.

The single phase AC monitor is frequently used with the built-in impulse duration/direction option. This application is illustrated on the following pages.



120 VAC Single Phase

Note

Current probes are included with Option 101 or 102 for 626-PA-6001.

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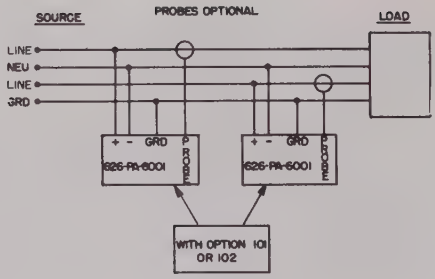
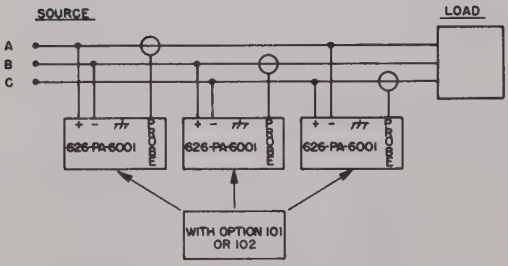


120V/240V Split Phase



3 Phase Delta

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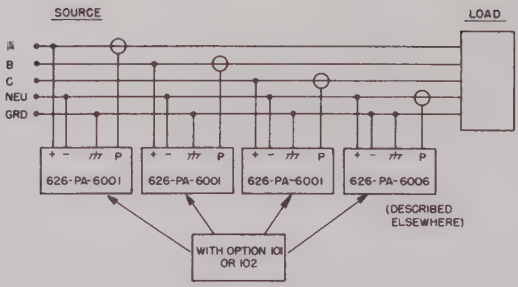

3 Phase Wye

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6.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires careful attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidelines should be utilized.

1. To minimize spurious impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment, i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade potential transformers for monitoring impulses on high voltage power lines is not recommended. The limited frequency response of most potential transformers may result in substantial variation of impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power source line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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7 OPERATING THE 6001

7.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6001 operation are described in Table 2. Figure 1 shows the typical front panel controls associated with the 6001. For a description of controls common to overall Model 626 operation, refer to Volume 1 of TM-106650U.

7.2 Selecting the Voltage Range

One of three ranges may be selected which effectively defines the maximum or full scale input voltage. For example, for a RANGE F.S. of 200V, the low limit value may range from 20-199 VAC; the upper limit may range from 21-200 VAC.

Table 2. 6001 Operating Controls

Item	Function
RANGE pushbutton and lamp	When lamp lights, user is cued to depress RANGE pushbutton and enter RANGE F.S. value via the numeric keyboard. Printer will prompt values to choose from.
LO LIMIT pushbutton	When depressed,enables numeric keyboard to program low limit voltage
HI LIMIT pushbutton	When depressed, enables numeric keyboard to program high limit voltage
SENS pushbutton	When depressed, enables numeric keyboard to program voltage sensitivity value.

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Figure 1. Typical Front Panel with 6001 Installed in Mainframe

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Table 2. 6001 Operating Controls (Cont'd)

Item	Function
IMP SENS pushbutton	When depressed, enables numeric keyboard to program impulse voltage sensitivity value.
F SENS pushbutton	When depressed, enables numeric keyboard to program frequency sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6001 memory.
DATA pushbutton	When depressed, produces data summary printout.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that channel. Only valid when range lamp is lit.

7.3 Programming Procedure

Assume it is desired to program a full scale range of 200V, a high limit of 125V, a low limit of 105V, voltage sensitivity of 2 volts, frequency sensitivity of 0.5 Hz and an impulse sensitivity of 100V. Voltage and frequency sensitivity sets the deviation from the present value above or below which a detected value produces a recorded disturbance.

For impulse measurements, the sensitivity corresponds to the absolute threshold, so that for an impulse sensitivity of 100 volts, a disturbance is recorded when impulse amplitude is greater than or equal to 100 volts.

For the example cited, program the 6001 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that the red lamp next to the RANGE pushbutton lights. Depress the RANGE pushbutton. The printer prompts:

Enter one of three ranges: 200, 400, or 600V F.S.

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d. Note that three yellow lamps above the numeric keyboard now light. Enter 200, using the keyboard. This selects the first range (20-200 VAC) of the plug-in. As each digit is entered, one lamp goes out. If an error is made, depress CLEAR ENTRY and correct the entry.

e. When the RANGE value has been programmed, the green lamp next to the ENTER pushbutton lights. Depress this pushbutton to enter the value. The RANGE entry (RANGE F.S. 200V) will now be echoed back on the printout.

f. When the ENTER indicator goes out, one red indicator above the center bank of pushbuttons lights. This indicates that another function may be programmed.

g. Depress the HI LIMIT pushbutton. Program the high limit value (125) as in step d.

h. When the green ENTER indicator lights, depress the ENTER pushbutton. The programmed high limit value will be echoed back on the printout.

i. Repeat steps f, g and h for the low limit voltage (105V) using the LO LIMIT pushbutton.

j. Repeat steps f, g and h for the voltage sensitivity, using the SENS pushbutton and programming the voltage value as 02.

k. Repeat steps f, g, and h for the frequency sensitivity (0.5Hz), using the F SENS pushbutton and programming the value as 0.5.

l. Repeat steps f, g, and h for the impulse sensitivity (0100 volts), using the IMP SENS pushbutton. The completed program printout should take the following form:

```
IMPULSE SENS  0100V
FREQ SENS     0.5HZ
VOLTAGE SENS   002V      ↑  (Read Up)
V LOW LIMIT   105 V      |
V HIGH LIMIT  125 V
RANGE F.S.    200V
```

NOTE

The instrument is designed to detect an invalid entry and to automatically shift high and low limits if range is changed without reprogramming the limits. If the RANGE value is selected as 200V and the user selects 205V as the low limit value, the printout ENTRY TOO HIGH will appear.

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m. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

8 SELECTING FACTORY/OPTION 103 PRESET PROGRAM

NOTE: Custom Preset Option 103 allows the user to choose his/her own program setup for the PRESET function.

To select the program stored in hard memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. An example of this sequence appears below.

```
                IMPULSE SENS  0100V
                FREQ SENS     00.5Hz
                VOLTAGE SENS  002V
    ↑           V LOW LIMIT   105 V
    |           V HIGH LIMIT  125 V
    |           RANGE F.S.    200V          (Factory Program)
    |               626-PA-5001
    |                   CH 1
    |           PROGRAM SUMMARY
(Read Up)                                   (Press PRESET)
    |           IMPULSE SENS  0025V
    |           FREQ SENS     02.0HZ
    |           VOLTAGE SENS   002 V        (Operator Program)
    |           V LOW LIMIT    100 V
    |           V HIGH LIMIT   130 V
    |           RANGE F.S.     200V
    |               626-PA-5001
    |                   CH 1
    |           PROGRAM SUMMARY
    |
    |            PROGRAM MODE
```

9 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 5001, it is recorded and displayed in characteristic manner.

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9.1 Overvoltage

An overvoltage condition exists when the monitored power line voltage exceeds the user-specified upper limit for more than 2.55 seconds. The beginning of an overvoltage condition is indicated by a printout such as the following:

```
4   HIGH   12:34:56.78
```

where 4 is the channel number and time is given in hours, minutes and seconds (to .Ø1 sec resolution).

When the line voltage recovers to normal, a printout such as the following occurs:

```
4   NORM   12:36:14.56
    135.8  V  MAX
```

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

9.2 Undervoltage

An undervoltage condition exists when the monitored power line voltage remains below the user-specified lower limit for more than 2.55 seconds. The beginning of an undervoltage condition is indicated by a printout such as the following:

```
4   LOW   1Ø:Ø9:12.34
```

When the line voltage returns to normal level, a message such as the following is printed:

```
4   NORM   1Ø:Ø9:12.34
    96.4   V   MIN
```

indicating when normal voltage was restored and the value of the lowest voltage reached during the undervoltage interval.

9.3 Voltage Change

A voltage change printout is triggered when the line voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user-selected integral voltage between one and 15 volts for a 115-volt line. The following example shows several voltage change printouts:

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Printout	Remarks
2 INC Ø1:Ø2:34.56 115.4 V	Voltage increased to 115.4V at time shown
2 DEC Ø1:Ø2:34.56 1Ø9.2 V	Voltage decreased to 1Ø9.2V at time shown

9.4 Voltage Surge

A Voltage Surge is defined as a line voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
3   HIGH   12:34:5Ø.49
```

When the line voltage returns to a normal level following a Surge condition, a message such as the following will be printed:

```
3   NORM   12:34:51.59
    139.2  V  MAX
    SURGE 1.1Ø SEC
```

In this case, the time at which the voltage returns to normal is shown as well as the maximum voltage reached and the surge duration.

9.5 Voltage Sag

A Voltage Sag is defined as a line voltage that decreases below the user-selected lower limit and then returns to an in-tolerance condition in less than 2.56 seconds. Sag printouts take the same form as surge printouts, with the term SAG replacing the term SURGE, and the term MIN replacing the term MAX.

NOTE

Voltage inputs less than 25V RMS will be printed out as Ø.ØV on the 6ØØ1.

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9.6 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 300 Hz to 500 kHz range. An impulse type disturbance produces a printout such as the following:

```
2   IMP    10:12:13.45
    +0139  V  PK
```

This printout indicates that an impulse which deviated from normal line voltage by +139 volts peak was detected on channel 2 at the time shown.

The impulse magnitude is measured with respect to the instantaneous point on the power frequency sinewave at which it occurs.

9.7 Frequency Change

A frequency change printout is triggered when the line frequency changes more than a preselected amount from the last printed value. The frequency change sensitivity is a user-selected value between 0.2 Hz and 3.0 Hz in 0.1 Hz increments. The following example shows several frequency change printouts.

```
3   FREQ    00:05:12.46
    059.0 HZ

3   FREQ    00:05:10.64
    059.5 HZ

3   FREQ    00:05:10.44
    060.0 HZ
```

10 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise.

The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in Channel 1 and that the limits for Channel 1 were programmed as follows:

RANGE F.S.	200 Vrms
V LOW LIMIT	105 Vrms
V HIGH LIMIT	125 Vrms
V SENSITIVITY	2 Vrms

The example printouts are referenced to figures 2 and 3 which illustrate overvoltage and voltage sag disturbances, respectively.

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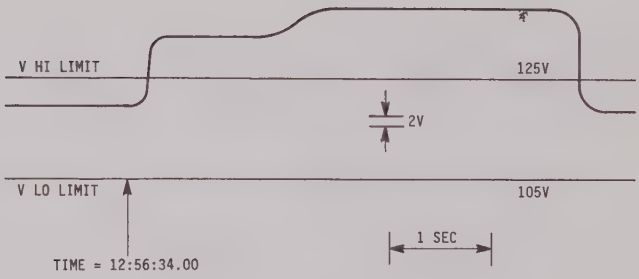

Figure 2. Overvoltage Disturbance (6001)

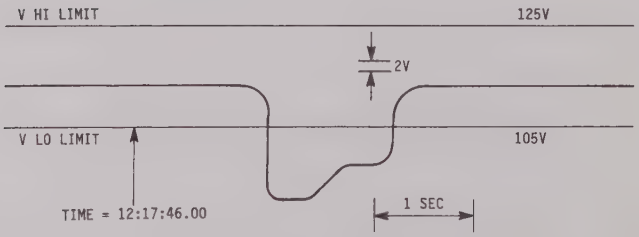

Figure 3. Voltage Sag Disturbance (6001)

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Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

```
1  NORM  12:56:38.51
   139.1  V  MAX

1  HIGH  12:56:34.21
```

Printout of overvoltage (fig. 2) in OUT-OF-LIMITS ONLY mode

```
1  NORM  12:56:38.51
   139.1  V  MAX

1  DEC  12:56:38.50
   130.2  V

1  INC  12:56:35.78
   137.3  V

(Read Up)

1  INC  12:56:35.62
   135.3  V

1  INC  12:56:35.40
   133.3  V

1  INC  12:56:34.22
   131.3  V

1  INC  12:56:34.21
   129.2  V

1  HIGH  12:56:34.21
```

Printout of overvoltage (fig. 2) in NORMAL mode

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```
1  DEC   12:56:38.61
   119.8  V

1  DEC   12:56:38.53
   121.8  V

1  DEC   12:56:38.51
   124.0  V

1  NORM  12::56:38.51
   139.1  V  MAX

1  DEC   12:56:38.50
   130.2  V

1  INC   12:56:35.78
   137.3  V

(Read Up) 1  INC   12:56:35.62
   135.3  V

1  INC   12:56:35.40
   133.3  V

1  INC   12:56:34.22
   131.3  V

1  INC   12:56:34.21
   129.2  V

1  HIGH  12:56:34.21

1  INC   12:56:34.20
   121.1  V

1  INC   12:50:12.34
   119.0  V
```

Printout of overvoltage (fig. 2) in MAXIMUM DETAIL mode

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```
1  NOR   12:17:48.61
   090.1  V  MIN
   SAG  1.25 SEC
1  LOW   12:17:47.36
```

Printout of voltage sag (fig. 3) in OUT-OF-LIMITS ONLY mode

```
1  NORM  12:17:48.61
   090.1  V  MIN
   SAG  1.25 SEC

1  INC   12:17:48.60
   103.1  V

1  INC   12:17:48.55
   098.0  V

1  INC   12:17:48.05
   096.0  V
1  INC   12:17:47.96
   094.0  V

1  DEC   12:17:47.39
   091.9  V

1  DEC   12:17:47.37
   094.1  V

1  DEC   12:17:47.36
   101.3  V

1  LOW   12:17:47.36
```

(Read Up)

Printout of voltage sag (fig. 3) in NORMAL mode

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```
1  INC   12:27:48.86
   112.1  V

1  INC   12:17:48.69
   110.0  V

1  INC   12:17:48.62
   108.1  V

1  INC   12:17:48.61
   105.9  V

1  NORM  12:17:48.61
   090.1  V  MIN
   SAG  1.25 SEC

1  INC   12:17:48.60
   103.1  V
1  INC   12:17:48.55
   098.0  V
1  INC   12:17:48.05
   096.0  V
1  INC   12:17:47.96
   094.0  V
1  DEC   12:17:47.39
   091.9  V
1  DEC   12:17:47.37
   094.1  V
1  DEC   12:17:47.36
   101.3  V
1  LOW   12:17:47.36
1  DEC   12:17:47.35
   110.8  V
1  INC   12:16:32.15
   113.0  V
```

Printout of voltage sag (fig. 3) in MAXIMUM DETAIL mode

(Read Up)

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10.1 System Check

When the PRINTOUT MODE switch is set to SYSTEM CHECK, a source of precise signals is applied to the front end circuitry of the 6001. Any inputs that are connected at this time will be automatically disconnected for the system check period. These signals fully verify the operational integrity of the module. The signals and the allowable tolerance levels are described below.

10.2 System Check Signals

Impulse: +160V pk

Voltage: 120.0 Vrms

Frequency:

626-PA-6001 -1,2	60 Hz
626-PA-6001 -3,4	50 Hz

10.3 System Check Tolerances

F.S. RANGE	IMPULSE	VOLTAGE	FREQUENCY
200	+134 to +186 Vpk	118.4 to 121.6V	48.8 to 50.2 Hz 59.8 to 60.2 Hz
400	+124 to +196 Vpk	118.0 to 122.0V	49.8 to 50.2 Hz 59.8 to 60.2 Hz
600	+114 to +206 Vpk	117.6 to 122.4V	49.8 to 50.2 Hz 59.8 to 60.2 Hz

11 626 Module Capacity

The 626 standard mainframe has an upper limit of the total load rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

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Plug-in	Load Rating
626-PA-6001	2 Units
626-PA-6001 with Extra Option Board	3 Units
626-PA-6002	2 Units
626-PA-6003	4 Units
626-PA-6006	2 Units
626-PA-6006 with Extra Option Board	3 Units
626-PA-6007	1 Unit
626-PA-6008	2 Units
626-PA-6009	4 Units
626-PA-6011	1 Unit
626-PA-6012	3 Units
626-PA-6014	1 Unit
626-PA-6015	4 Units

When selecting modules for installation in any mainframe, simply verify that the sum of the load ratings of the installed modules does not exceed 20.

12 STANDARD ACCESSORIES

Model No.	Part No.	Quantity	Description
626PA-6001-1 (-3)	TM-106705U Vol 1	1	Operator's Manual
626PA-6001-2 (-4)	TM-106705U Vol 1	1	Operator's Manual
	110480-G1	1	AC Cable with tinned leads

Plug-in Configurations

626-PA-6001-1	60 Hz calibration with barrier strip inputs
626-PA-6001-2	60 Hz calibration with connector inputs
626-PA-6001-3	50 Hz calibration with barrier strip inputs
626-PA-6001-4	50 Hz calibration with connector inputs

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13 IMPULSE DURATION/DIRECTION OPTION, OPTION 101 FOR 626-PA-6001 PLUG-IN (NOT COMPATIBLE WITH OPTION 102)

13.1 Introduction

The following paragraphs describe the differences between the 6001 with Option 101 and the standard 6001.

NOTE

The following data supersedes that found in previous paragraphs of this manual unless otherwise stated.

13.2 Purpose

Option 101 has no effect on the line frequency measurements of the 6001 described in previous paragraphs. It also does not affect the measurement of impulse polarity and peak voltage. Option 101 is designed to provide information on impulse duration. In addition, if the current probe is used, direction of origin will be determined for impulses having a current of 1 Amp or greater at the time of measurement.

13.3 Equipment Characteristics

Technical specifications for Option 101 are listed in Table 3. All specifications for the 6001, listed in Table 1, still apply.

Table 3. 626-PA-6001 Option 101 Technical Specifications

IMPULSE DURATION

Range: 1 uSec to 1023 uSec

Accuracy: ±6% of reading ±0.3% F.S. for 1/2 sinewave pulses up to 100 uSec duration greater than 100 Vpk.*

Typically

-10% at 200 uSec, -20% at 400 uSec, -50% at 1000 uSec.

* 100 Vpk on 200 Vrms Range
200 Vpk on 400 Vrms Range
400 Vpk on 600 Vrms Range

Timing Reference Points: Start at 25V** - stop at 30% of Vpk.

** 25V on 200 Vrms Range
50V on 400 Vrms Range
100V on 600 Vrms Range

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Table 3. 626-PA-6001 Option 101 Technical Specifications (Cont'd.)

Minimum Impulse Voltage:	50 Vpk on 200 Vrms Range 100 Vpk on 400 Vrms Range 200 Vpk on 600 Vrms Range
IMPULSE DIRECTION OF ORIGIN	
Minimum Impulse Current:	1 Amp for 0.1 uSec before and after measurement.
Minimum Impulse Voltages:	50 Vpk on 200 Vrms Range 100 Vpk on 400 Vrms Range 200 Vpk on 600 Vrms

13.4 Installation in Mainframe

The module is installed in the mainframe in the same manner as the standard 6001 (par. 5).

13.5 Connections to the Module

Connecting the 6001 to the line to be monitored is the same as described in paragraph 6. If impulse direction information is required, the current probe must be connected in the following manner:

a.) Turn off AC power to the line that is to be monitored.

b.) Attach the current probe connector to its mating connector on the rear panel of the 6001.

c.) Install current probe on the line which is connected to the "+" voltage terminal of the corresponding channel, being sure that the LOAD and SOURCE markings on the probe are oriented such that SOURCE is toward incoming power. Proper connections are shown in Figure 4.

d.) Reapply AC power.

Note: Printouts of impulse direction of origin will correlate with the orientation of the LOAD and SOURCE markings on the current probe.

13.6 Operating the 6001 With Option 101

Operation of the 6001 with Option 101 requires no additional programming steps. Programming is the same as described in paragraph 7.3.

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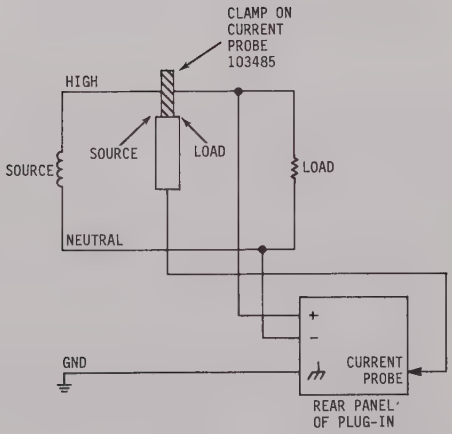

Figure 4. Proper Connections of 626-PA-6001 for Use with Current Probe

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13.7 Description of Data Printouts

The only printouts affected by the addition of Option 101 are those for module identification and impulse data.

PROGRAM SUMMARY

When the Program Summary key (designated "PROG") is depressed, the module will be identified as a 626-PA-6001R1 as in the following example.

```
          IMPULSE SENS 0100V
     ↑    FREQ SENS    00.5Hz
     |    VOLTAGE SENS 002V
(Read     V LOW LIMIT  105V
  Up)     V HIGH LIMIT 125V
     |    RANGE F.S.    200V
     |      626-PA-6001R1
     |          CH1
          11/17/83    13:43:25
            PROGRAM SUMMARY
```

IMPULSE

When used with the 200V FS range, a minimum impulse voltage of 50 Vpk is required to obtain duration data. For information on the direction of origin, a minimum impulse voltage of 50 Vpk and a minimum impulse current of 1 Amp is required. These minimum voltage levels increase with range, as shown in Table 3, but the minimum current required is not affected.

If the current probe is not used, or if it is used but the impulse current is less than 1 Amp at the time of measurement, the printout will take on the following form:

```
4 IMP 12:34:56.88
+2057V, 089uS
```

This printout indicates that an impulse which deviated from the normal line voltage for 89 microseconds with a peak voltage of 2057 volts was detected on channel 4 at the time shown. The "+" preceding the impulse voltage indicates that the impulse was positive with respect to the "-" or neutral terminal on the 6001 rear panel.

IMPULSE WITH DIRECTION

When the current probe is used and the impulse current is greater than 1 Amp at the time of measurement, the printout will take the following form:

```
4 IMP 12:34:57.00
+2057V, LOAD, 089uS
```

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This printout indicates that an impulse originating from the load, of +2057 volts peak and 89 microseconds in duration, occurred at the time shown. If the direction had been from the source, SRCE would be printed in place of LOAD in the example.

Figure 5 illustrates an impulse duration measurement.

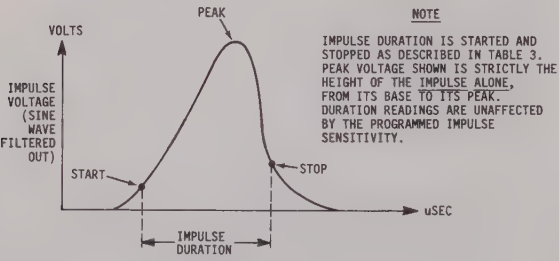
PEAK
VOLTS
IMPULSE VOLTAGE (SINE WAVE FILTERED OUT)
START
STOP
uSEC
IMPULSE DURATION
NOTE
IMPULSE DURATION IS STARTED AND STOPPED AS DESCRIBED IN TABLE 3. PEAK VOLTAGE SHOWN IS STRICTLY THE HEIGHT OF THE IMPULSE ALONE, FROM ITS BASE TO ITS PEAK. DURATION READINGS ARE UNAFFECTED BY THE PROGRAMMED IMPULSE SENSITIVITY.

Figure 5. Impulse Duration Measurement

13.8 Printout Modes

Printout modes and calibration signals remain the same as in the standard 6001 described in paragraph 10.

14 IMPULSE STRENGTH/DIRECTION OPTION, OPTION 102 FOR 626-PA-6001 PLUG-IN (NOT COMPATIBLE WITH OPTION 101)

14.1 Introduction

The following paragraphs describe the differences between the 6001 with Option 102 and the standard 6001.

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NOTE

The following data supersedes that found in paragraphs 1-12 unless otherwise stated.

14.2 Purpose

Option 102 has no effect on the line frequency measurements of the 6001 previously described. It also does not affect the measurement of impulse polarity and peak voltage. Option 102 is designed to provide information on impulse strength. In addition, if the current probe is used, direction of origin will be determined for impulses having a current of 1 Amp or greater at the time of measurement.

14.3 Equipment Characteristics

Technical specifications for Option 102 are listed in Table 4. All specifications for the 6001, listed in Table 1, still apply.

Table 4. 626-PA-6001 Option 102 Technical Specifications

IMPULSE STRENGTH

Ranges:
200V F.S. Range 0.0002 to 0.2046 V-Sec
400V F.S. Range 0.0004 to 0.4092 V-Sec
600V F.S. Range 0.0008 to 0.8184 V-Sec

Accuracy: ±10% of reading, ±0.1% of F.S. for 1/2 sinewave pulses up to 100 uSec duration greater than 100 Vpk*. Typically -20% at 200 uSec, -50% at 500 uSec.

* 100 Vpk on 200V F.S. Range
200 Vpk on 400V F.S. Range
400 Vpk on 600V F.S. Range

Timing Reference Points: Start at 25V** - stop at 30% of Vpk.

** 25V on 200 Vrms Range
50V on 400 Vrms Range
100V on 600 Vrms Range

IMPULSE DIRECTION OF ORIGIN

Minimum Impulse Current: 1 Amp for 0.1 uSec before and after measurement.

Minimum Impulse Voltages: 50 Vpk on 200 Vrms Range
100 Vpk on 400 Vrms Range
200 Vpk on 600 Vrms Range

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14.4 Installation in Mainframe

The module is installed in the mainframe in the same manner as the standard 6001 described in paragraph 5.

14.5 Connections to the Module

Connecting the 6001 to the line to be monitored is the same as described in paragraph 6. If impulse direction information is required, the current probe must be connected in the following manner.

a.) Turn off AC power to the line that is to be monitored.

b.) Attach the current probe connector to its mating connector on the rear panel of the 6001.

c.) Install current probe on the line which is connected to the "+" voltage terminal of the corresponding channel, being sure that the LOAD and SOURCE markings on the probe are oriented such that SOURCE is toward incoming power. Proper connections are shown in Figure 4.

d.) Reapply AC power.

Note: Printouts of impulse direction of origin will correlate with the orientation of the LOAD and SOURCE markings on the current probe.

14.6 Operating the 6001 with Option 102

Operation of the 6001 with Option 102 requires no additional programming steps; programming is the same as described in paragraph 7.3.

14.7 Description of Data Printouts

The only printouts affected by the addition of Option 102 are those for module identification and impulse data.

PROGRAM SUMMARY

When the Program Summary key (designated "PROG") is depressed, the module will be identified as a 626-PA-6001R2 as in the following example.

```
IMPULSE SENS     0100V
FREQ SENS        005.Hz
VOLTAGE SENS     002V
V LOW LIMIT      105V
V HIGH LIMIT     125V
RANGE F.S.       200V
   626-PA-6001R2
       CH1                    (Read Up)
11/17/83    13:55:30
  PROGRAM SUMMARY
```

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IMPULSE

When used with the 200V FS range, a minimum impulse voltage of 50 Vpk is required to obtain strength data. For information on the direction of origin, a minimum impulse voltage of 50 Vpk and a minimum impulse current of 1 Amp is required. These minimum voltage levels increase with range, as shown in Table 4, but the minimum current required is not affected.

If the current probe is not used, or if it is used but the impulse current is less than 1 Amp at the time of measurement, the printout will take on the following form:

```
4 IMP 12:34:56.88
0.0156 V-SEC
+2057V
```

This printout indicates that an impulse which deviated from the normal line voltage with a strength of 0.0156V-Sec and a peak voltage of 2057 volts was detected on channel 4 at the time shown. The "+" preceding the impulse voltage indicates that the impulse was positive with respect to the "-" or neutral terminal on the 6001 rear panel.

Figure 6 illustrates an impulse strength measurement.

IMPULSE WITH DIRECTION

When the current probe is used and the impulse current is greater than 1 Amp at the time of measurement, the printout will take the following form:

```
4 IMP 12:34:57.00
0.0156 V-SEC
+2057V, LOAD
```

This printout indicates that an impulse originating from the load, of +2057 volts peak and an area of 0.0256V-Sec, occurred at the time shown. If the direction had been from the source, SRCE would be printed in place of LOAD in the example.

14.8 Printout Modes

Printout modes and calibration signals remain the same as in the standard 6001 described in paragraph 10.

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-110385-1U

VOLUME I

OPERATOR'S MANUAL

626-PA-6002A

DC MONITOR

NOTE: Refer to Volume 2 (Service Manual) of TM-110385-1U for maintenance data.

1 May 1984

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626-PA-6002A DC MONITOR

1 INTRODUCTION

This manual provides operating instructions for the 626-PA-6002A DC Monitor Plug-in, herinafter referred to as the 6002A. The 6002A is designed for installation in the Model 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in TM-106650U.

2 PURPOSE

The 6002A monitors disturbances on DC power buses. This single channel unit has an overall range of 0.5 to to 80 VDC, programmable in three ranges. With thresholds programmed by the user, the 6002A stores, analyzes, classifies and prints out quantitative and qualitative disturbance data. Accompanying the data is a printout of the time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The 6002A monitors two types of disturbances: DC power bus transients and waveform disturbances. Power bus transients are divided into five display categories: overvoltage, undervoltage, voltage change, voltage surge and voltage sag. Waveform disturbances, identified as "impulses" include all conditions that cause the power bus waveform to deviate from an ideal (flat) waveform. The threshold value of each type of disturbance, above which detection and printout occurs, is operator programmable. Except for an automatic summary printout at the end of each day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of each day. This feature permits long term unattended operation.

The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

3 EQUIPMENT CHARACTERISTICS

The 6002A is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in any of the five slots of the Model 626 Universal Disturbance Analyzer. Technical specifications of the 6002A are listed in Table 1.

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Table 1. 626-PA-6002A Specifications

Input	2-wire differential Z_{in} = 10 meg plus 500 pf (each side to ground)
Overall Voltage Ranges	0.5 to 20V 1.0 to 40V 2.0 to 80V
User set voltage lower spec limit (0.1V increments)	
20V Range	0.5 to 19.9V
40V Range	1.0 to 39.8V
80V Range	2.0 to 79.6V
User set voltage upper spec limit (0.1V increments)	
20V Range	0.6 to 20.0V
40V Range	1.2 to 40.0V
80V Range	2.4 to 80.0V
Voltage Change Sensitivity (0.1V increments)	
20V Range	0.1 to 5.0V
40V Range	0.2 to 10V
80V Range	0.4 to 20V
Voltage Measurement Accuracy	±1% of reading ±0.5% of F.S.
Voltage Measurement Resolution	
20V Range	0.04V
40V Range	0.08V
80V Range	0.16V
Impulse Ranges (2 mSec to 1 uSec)	
20V Range	0.5 to 20V
40V Range	1.0 to 40V
80V Range	2.0 to 80V

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Table 1. 626-PA-6002A Specifications (cont'd.)

Impulse Thresholds (0.1 volt increments)	
20V Range	0.5 to 20V
40V Range	1.0 to 40V
80V Range	2.0 to 80V
Impulse Accuracy	+5% of reading +1% F.S. for half-sinewave impulses 10 uSeconds in duration regardless of polarity or grounding. Error increases to +10% of reading, +1% F.S. at 5 uSec and 50 uSec pulse durations, and is typically -6 dB at 2 mSEc and 1 uSec pulse durations.

4 INSTALLATION

To install the 6002A in the mainframe, proceed as follows:

CAUTION: Be sure 626 is turned off and that all power connected to all plug-in modules is turned off.

a. Position the top and bottom front corners of the plug-in module in the upper and lower tracks at the desired slot position at the rear of the mainframe.

b. Carefully slide the module into the mainframe until it is firmly seated.

c. Tighten the top and bottom captive screws to secure the module to the mainframe.

5 CONNECTING DC POWER SOURCE TO MODULE

5.1 Connection Procedure

The 6002A is supplied with a barrier type terminal strip under a small cover (626-PA-6002A-1) or with a 3 pin connector (626-PA-6002A-2) located at the rear of the module. Proceed as follows:

a. Insert key in FUNCTION key switch on front panel of mainframe and set switch to OFF position.

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b. Turn off DC power source that is to be monitored by the module.

c. Remove the terminal strip safety cover to expose the connections. Now connect the DC line to the three power terminals (positive DC to the (+); negative to the (-), and earth ground to the third terminal, as marked). When all connections have been made, be sure to replace the terminal block cover, then reapply DC power.

d. If a 3 pin connector is installed on the rear panel of the 6002A, the DC source to be monitored should be wired to the cable assembly (DTI P/N 110475) supplied with the module. If the supplied cable is not adequate, the mating 3-pin connector can be obtained from AMP, Inc. The part numbers are as follows:

Part Number	Description
1-480700-0	Connector Housing
1-640720-0	Strain Relief
350690-1	Pin Contacts

Attach mating connector to rear panel connector then reapply DC power.

CAUTION

To avoid damaging the equipment, do not apply DC voltages in excess of 100V peak to the 6002A.

5.2 Circuit Applications

WARNING

Connection should only be performed by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18 (1 mm^2). For branch circuits with higher ampacity, refer to National Electric Code (ANSI CI-1975 Para. 240-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

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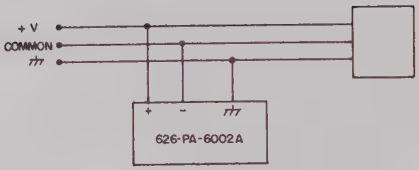
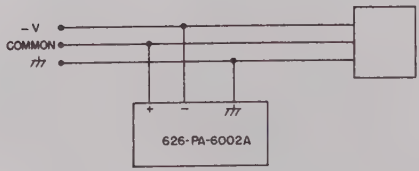


Connection to Positive DC Sources



Connection to Negative DC Sources

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5.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires carefull attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidlines should be utilized.

1. To minimize spurious impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment, i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade potential transformers for monitoring impulses on high voltage power lines is not recommended. The limited frequency response of most potential transformers may result in substantial variation of impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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6 OPERATING THE 6002A

6.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6002A operation are described in Table 2. Figure 1 shows the typical front panel controls associated with the 6002A. For a description of controls common to overall Model 626 operation, refer to Volume 1 of TM-106650U.

Table 2. 6002A Operating Controls

Item	Function
RANGE pushbutton and lamp	When lamp lights, user is cued to depress RANGE pushbutton and enter the desired full scale voltage range (20, 40, or 80) via the numeric keyboard.
LO LIMIT pushbutton	When depressed, enables numeric keyboard to program low limit voltage.
HIGH LIMIT pushbutton	When depressed, enables numeric keyboard to program high limit voltage.
SENS pushbutton	When depressed, enables numeric keyboard to program voltage sensitivity value.
IMP SENS pushbutton	When depressed, transfers numeric keyboard to program impulse voltage sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6002A memory.
DATA pushbutton	When depressed, produces data summary printout.
PRESET pushbutton	With FUNCTION switch set to program and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that channel.

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Figure 1. Typical Front Panel with 6002A Installed in Mainframe.

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6.2 Programming Procedure

Assume it is desired to program a full scale range of 20V, a high limit of 15V, a low limit of 10V, voltage sensitivity of 0.5 volts, and an impulse sensitivity of 2V. Voltage sensitivity sets the deviation from the present voltage value above or below which a detected value produces a recorded disturbance. For impulse measurements, the sensitivity corresponds to the absolute threshold, so that for an impulse sensitivity of 2 volts, a disturbance is recorded when impulse amplitude is greater than or equal to 2 volts.

For the example cited, program the 6002A as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that the red lamp next to the RANGE pushbutton lights. Depress the RANGE pushbutton.

d. Note that two yellow lamps above the numeric keyboard now light. Enter 20, using the keyboard. This selects the first full scale range (0.5 to 20.0V) of the plug-in. As each digit is entered, one lamp goes out. If an error is made, depress CLEAR ENTRY and correct the entry.

e. When the full scale value has been programmed, the green lamp next to the ENTER pushbutton lights. Depress this pushbutton to enter the value. The full scale entry (RANGE F.S. 20.0V) will now be echoed back on the printout.

f. When the ENTER indicator goes out, one red indicator above the center bank of pushbuttons lights. This indicates that another function may be programmed.

g. Depress the HI LIMIT pushbutton. Program the high limit value (15) as in step d.

h. When the green ENTER indicator lights, depress the ENTER pushbutton. The programmed high limit value will be echoed back on the printout.

i. Repeat steps f, g, and h for the low limit value (10) using the LO LIMIT pushbutton.

j. Repeat steps f, g, and h for the voltage sensitivity, using the SENS pushbutton and programming the voltage value as 0.5.

k. Repeat steps f, g, and h for the impulse sensitivity (02 volts), using the IMP SENS pushbutton. The completed program printout should take the following form:

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```
IMPULSE SENS Ø2.ØV
VOLTAGE SENS Ø0.5V
 V LOW LIMIT 1Ø.ØV
V HIGH LIMIT 15.ØV
 RANGE F. S. 2Ø.ØV
```

NOTE

The instrument is designed to detect an invalid entry and to automatically shift high and low limits if range is changed without reprogramming the limits. For example, if the full scale value is selected as 20V and the user selects 22V as the low limit value, the printout ENTRY TOO HIGH will appear.

1. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

7 SELECTING THE FACTORY/OPTION 103 PRESET PROGRAM

NOTE: Custom Preset Option 103 allows the user to choose his/her own program setup for the PRESET function.

To select the program stored in hard memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. An example of this sequence appears below.

```
IMPULSE SENS  Ø2.ØV
VOLTAGE SENS  Ø0.3V
 V LOW LIMIT  11.Ø
V HIGH LIMIT  14.ØV          (Factory Program)
RANGE F.S.    2Ø.ØV
   626-PA-6002A
       CH 1
  PROGRAM SUMMARY
```

(Read Up) (Press PRESET)

```
IMPULSE SENS  Ø2.ØV
VOLTAGE SENS  Ø0.5V          (Operator
                              Program)
V LOW LIMIT  1Ø.ØV
V HIGH LIMIT  15.ØV
 RANGE F.S.  2Ø.ØV
   626-PA-6002A
       CH1
  PROGRAM SUMMARY
   PROGRAM MODE
```

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8 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6002A, it is recorded and displayed in characteristic manner.

8.1 Overvoltage

An overvoltage condition exists when the monitored DC bus voltage exceeds the user specified upper limit for more than 2.55 seconds. The beginning of an overvoltage condition is indicated by a printout such as the following:

```
4    HIGH    12:34:56.78
```

where 4 is the channel number and time is given in hours, minutes and seconds (to .01 sec resolution).

When the DC voltage recovers to normal, a printout such as the following occurs:

```
4    NORM    12:36:14.56
          .5  V  MAX
```

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

8.2 Undervoltage

An undervoltage condition exists when the monitored power line voltage remains below the user-specified lower limit for more than 2.55 seconds. The beginning of an undervoltage condition is indicated by a printout such as the following:

```
4    LOW     10:09:12.34
```

When the line voltage returns to normal level, a message such as the following is printed:

```
4    NORM    10:09:23.45
     10.4  V  MIN
```

indicating when normal voltage was restored and the value of the lowest voltage reached during the undervoltage interval.

8.3 Voltage Change

A voltage change printout is triggered when the line voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user-selected voltage that varies with the full scale range selected. For the 20V range, a sensitivity of 0.1 to 5.0V may be selected. The following example shows several voltage change printouts:

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Printout	Remarks
2 INC 01:02:34.56 12.4 V	Voltage increased to 12.4V at time shown
2 DEC 01:02:34.56 11.3 V	Voltage decreased to 11.3V at time shown

8.4 Voltage Surge

A Voltage Surge is defined as a DC voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
3    HIGH    12:34:50.49
```

When the DC voltage returns to a normal level following a Surge condition, a message such as the following will be printed:

```
3    NORM    12:34:51.59
     15.1  V  MAX
     SURGE  1.10 SEC
```

In this case, the time at which the voltage returned to normal is shown as well as the maximum voltage reached and the surge duration.

8.5 Voltage Sag

A Voltage Sag is defined as a line voltage that decreases below the user-selected lower limit and then returns to an in-tolerance condition in less than 2.56 seconds. Sag printouts take the same form as surge printouts, with the term SAG replacing the term SURGE, and the term MIN replacing the term MAX.

8.6 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 300 Hz to 500 kHz range. An impulse type disturbance produces a printout such as the following:

```
2    IMP     10:12:13.45
     +020  V  PK
```

This printout indicates that an impulse which deviated from normal DC voltage by +20 volts peak was detected on Channel 2 at the time shown.

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9 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise.

The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in Channel 1 and that the limits for Channel 1 were programmed as follows:

RANGE F.S.	80V	V HIGH LIMIT	70V
V LOW LIMIT	50V	V SENSITIVITY	2V

The example printouts are referenced to figures 2 and 3 which illustrate overvoltage and voltage sag disturbance, respectively.

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

```
1 NORM 12:56:38.51
  84.1  V  MAX

1 HIGH 12:56:34.21
```

Printout of overvoltage (fig. 2) in OUT-OF-LIMITS ONLY mode

```
1 NORM 12:56:38.51
  84.1  V  MAX

1  DEC  12:56.38.50
  75.2 V

1  INC  12:56:35.78
  82.3 V

1  INC  12:56:35.62
  80.3 V

1  INC  12:56:35.40
  78.3 V

1  INC  12:56:34.22
  76.3 V

1  INC  12:56:34.21
  74.2 V

1  HIGH  12:56:34.21
```

(Read Up) ↑

Printout of overvoltage (fig. 2) in NORMAL MODE

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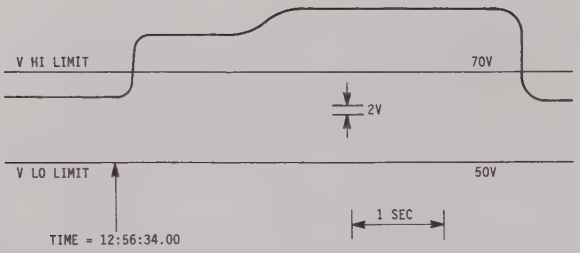

Figure 2. Overvoltage Disturbance (6002A)

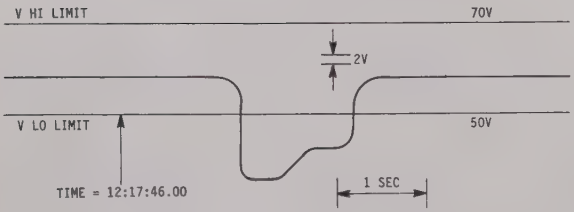

Figure 3. Voltage Sag Disturbance (6002A)

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```
1  DEC  12:56:38.61
   64.8 V

1  DEC  12:56:38.53
   66.8  V

1  DEC  12:56:38.51
   69.0  V

1  NORM 12:56:38.51
   84.1  V  MAX

1  DEC  12:56:38.50
   75.2 V

1  INC  12:56:35.78
   82.3 V

1  INC  12:56:35.62
   80.3 V

1  INC  12:56:35.40
   78.3 V

1  INC  12:56:34.22
   76.3 V

1  INC  12:56:34.21
   74.2 V

1  HIGH  12:56:34.21

1  INC  12:56:34.20
   66.1 V

1  INC  12:50:12.34
   64.0 V
```

(Read Up)

Printout of overvoltage (fig. 2) in MAXIMUM DETAIL mode

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```
1  NORM  12:17:48.61
   Ø35.1  V  MIN
   SAG 1.25  SEC

1 LOW  12:17:47.36


1  NORM 12:17:48.61
   Ø35.1  V  MIN
   SAG  1.25  SEC

1  INC  12:17:48.60
   48.1   V


1  INC  12:17:48.55
   Ø43.Ø  V

1  INC  12:17:48.Ø5
   Ø41.Ø  V

1  INC  12:17:47.96
   Ø39.Ø  V

1  DEC  12:17:47.39
   Ø36.9  V

1  DEC  12:17:47.37
   Ø39.1  V

1  DEC  12:17:47.36
   Ø46.3  V

1  LOW  12:17:47.36
```

Printout of voltage sag (fig. 3) in OUT OF-LIMITS ONLY mode

(Read Up) ↑

Printout of voltage sag fig. 3) in NORMAL mode

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```
1  INC  12:17:48.86
   57.1 V

1  INC  12:17:48.69
   55.1 V

1  INC  12:17:48.62
   53.1 V

1  INC  12:17:48.61
   50.9 V

1  NORM 12:17:48.61
   035.1 V MIN
   SAG 1.25 SEC

1  INC  12:17::48.60
   48.1 V

1  INC  12:17:48.55
   043.0 V

1  INC  12:17:48.05
   041.0 V

1  INC  12:17:47.96
   039.0 V

1  DEC  12:17:47.39
   036.9 V

1  DEC 12:17:47.37
   039.1 V

1  DEC  12:17:47.36
   46.3 V

1  LOW  12:17:47.36

1  DEC  12:17.47.35
   55.8 V

1  INC  12:16:32.15
   58.0 V
```

(Read Up)

Printout of voltage sag (fig. 3) in MAXIMUM DETAIL mode

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9.1 System Check

When the PRINTOUT MODE switch is set to SYSTEM CHECK, a source of precise signals is applied to the front end circuitry of the 6002A. Any inputs that are connected at this time will be automatically disconnected for the system check period. These signals fully verify the operational integrity of the module. The system check signals and the allowable tolerance levels are described below.

9.2 System Check Signals

Impulse: +10.00V pk

Voltage: 5.00V DC

9.3 System Check Tolerances

F.S. Range	Impulse	Voltage
20V	8.8 to 11.2 Vpk	4.85 to 5.15 V
40V	8.6 to 11.4 Vpk	4.75 to 5.25 V
80V	8.2 to 8.11 Vpk	4.55 to 5.45 V

10 STANDARD ACCESSORIES

Model #	Part #	Quantity	Description
626PA6002A1 Barrier Block Version	TM110385-1U Vol. 1)	1	Operator's Manual
626PA6002A2 Connector Version	TM110385-1U Vol. 1)	1	Operator's Manual
	110475	1	D.C. Cable

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11 626 MODULE CAPACITY

The 626 standard mainframe has an upper limit of the total load rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-In	Load Rating
626-PA-6001	2 Units
626-PA-6001 With Extra Option Board	3 Units
626-PA-6002	2 Units
626-PA-6003	4 Units
626-PA-6006	2 Units
626-PA-6007	1 Unit
626-PA-6008	2 Units
626-PA-6009	4 Units
626-PA-6011	1 Unit
626-PA-6012	3 Units
626-PA-6014	1 Unit
626-PA-6015	4 Units

When selecting modules for installation in any mainframe, simply verify that the sum of the load ratings of the installed modules does not exceed 20.

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12 IMPULSE DURATION OPTION 101 FOR 626-PA-6002A PLUG-IN (NOT COMPATIBLE WITH OPTION 102)

12.1 Introduction

The following paragraphs describe the differences between the 6002A with Option 101 and the standard 6002A.

NOTE

The following data supersedes that found in previous paragraphs of this manual unless otherwise stated.

12.2 Purpose

Option 101 is designed to provide information on impulse duration. It has no effect on the measurements made by the standard 6002A as described in previous paragraphs.

12.3 Equipment Characteristics

Technical specifications for Option 101 are listed in Table 3. All specifications for the 6002A, listed in Table 1, still apply.

Table 3. 626-PA-6002A Option 101 Technical Specifications

IMPULSE DURATION

Range: 1 uSec to 1023 uSec

Accuracy: ±6% of reading ±0.3% F.S. for 1/2 sinewave pulses up to 100 uSec duration greater than 2.00 Vpk. * Typically - 10% at 200 uSec, -20% at 400 uSec, -50% at 1000 uSec.

* 2.00 Vpk on 20 V F.S. Range
4.00 Vpk on 40 V F.S. Range
8.00 Vpk on 80 V F.S. Range

Timing Reference Points: Start at 0.5V** - stop at 30% of Vpk.

** 0.5 Vpk on 20 V dc Range
1.0 Vpk on 40 V dc Range
2.0 Vpk on 80 V dc Range

Minimum Impulse Voltages: 1.00 Vpk on 20.0 V dc Range
2.00 Vpk on 40.0 V dc Range
4.00 Vpk on 80.0 V dc Range

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12.4 Installation in Mainframe

The module is installed in the mainframe in the same manner as the standard 6002A (par. 4).

12.5 Connections to the Module

Connecting the 6002A to the line to be monitored is the same as described in paragraph 5.

12.6 Operating the 6002A with Option 101

Operation of the 6002A with Option 101 requires no additional programming steps. Programming is the same as described in paragraph 6.2.

12.7 Description of Data Printouts

The only printouts affected by the addition of Option 101 are those for module identification and impulse data.

PROGRAM SUMMARY

When the Program Summary key (designated "PROG") is depressed, the module will be identified as a 626-PA-6002AR1 as in the following example.

```
                IMPULSE SENS 02.0V
(Read           VOLTAGE SENS 00.5V
  up)    ↑      V LOW LIMIT  10.0V
         |      V HIGH LIMIT 15.0V
         |      RANGE F.S.   20.0V
         |         626-PA-6002AR1
         |             CH1
         |      11/17/83   14:10:53
         |         PROGRAM SUMMARY
```

IMPULSE

When used with the 20.0V FS range, a minimum impulse voltage of 1.00 Vpk is required to obtain duration data. This minimum voltage level increases with range, as shown in Table 3.

The impulse printout will have the following form:

```
4 IMP 12:34:56.88
+ 03.64V PK, 089uS
```

This printout indicates that an impulse which deviated from the normal bus voltage for 89 microseconds with a peak voltage of 3.64 volts was detected on channel 4 at the time shown. The "+" preceding the impulse voltage indicates that the impulse was positive with respect to the "-" terminal on the 6002A rear panel.

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Figure 4 illustrates an impulse duration measurement.

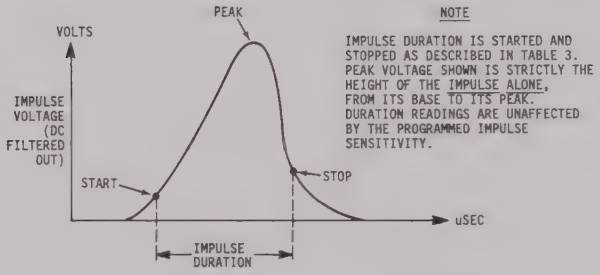
PEAK
VOLTS
IMPULSE VOLTAGE (DC FILTERED OUT)
START
STOP
uSEC
IMPULSE DURATION
NOTE
IMPULSE DURATION IS STARTED AND STOPPED AS DESCRIBED IN TABLE 3. PEAK VOLTAGE SHOWN IS STRICTLY THE HEIGHT OF THE IMPULSE ALONE, FROM ITS BASE TO ITS PEAK. DURATION READINGS ARE UNAFFECTED BY THE PROGRAMMED IMPULSE SENSITIVITY.

Figure 4. Impulse Duration Measurement

12.8 Printout Modes

Printout modes and calibration signals remain the same as in the standard 6002A described in paragraph 9.

13 IMPULSE STRENGTH OPTION, OPTION 102 FOR 526-PA-6002A PLUG-IN (NOT COMPATIBLE WITH OPTION 101)

13.1 Introduction

The following paragraphs describe the differences between the 6002A with Option 102 and the standard 6002A.

NOTE

The following data supersedes that found in paragraphs 1 through 11 unless otherwise stated.

13.2 Purpose

Option 102 is designed to provide information on impulse strength (volt-second) area; it has no effect on the measurements made by the standard 6002A.

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13.3 Equipment Characteristics

Technical specifications for Option 102 are listed in Table 4. All specifications for the 6002A, listed in Table 1, still apply.

Table 4. 626-PA-6002A Option 102 Technical Specifications

IMPULSE STRENGTH

Ranges: 20.0V F.S. Range 0.000004 to 0.004092 V-Sec
40.0V F.S. Range 0.000008 to 0.008184 V-Sec
80.0V F.S. Range 0.000016 to 0.016368 V-Sec

Accuracy: ±10% of reading, ±0.1% of F.S. for 1/2 sinewave pulses up to 100 uSec duration greater than 2.00 Vpk*. Typically -20% at 200 uSec, -50% at 500 uSec.

* 2.00 Vpk on 20.0V F.S. Range
4.00 Vpk on 40.0V F.S. Range
8.00 Vpk on 80.0V F.S. Range

Timing Reference Points: Start at 0.5V** - stop at 30% of Vpk.

** 0.5 Vpk on 20 V dc Range
1.0 Vpk on 40 V dc Range
2.0 Vpk on 80 V dc Range

Minimum Impulse Voltages: 1.00 Vpk on 20.0 Vdc Range
2.00 Vpk on 40.0 Vdc Range
4.00 Vpk on 80.0 Vdc Range

13.4 Installation in Mainframe

The module is installed in the mainframe in the same manner as the standard 6002A (par. 4).

13.5 Connections to the Module

Connecting the 6002A with Option 102 to the line to be monitored is the same as the standard 6002A (par. 5).

13.6 Operating the 6002A with Option 102

Operation of the 6002A with Option 102 requires no additional progamming steps. Programming is the same as described in paragraph 6.2.

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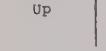
13.7 Description of Data Printouts

The only printouts affected by the addition of Option 102 are those for module identification and impulse data.

PROGRAM SUMMARY

When the Program Summary key (designated "PROG") is depressed, the module will be identified as a 626-PA-6002AR2 as in the following example.




```
IMPULSE SENS     01.0V
VOLTAGE SENS     00.5V
V LOW LIMIT      10.0V
V HIGH LIMIT     15.0V
RANGE F. S.      20.0V
  626-PA-6002AR2
      CH1
11/17/83   14:27:39
PROGRAM SUMMARY
```

IMPULSE

When used with the 20.0V FS range, a minimum impulse voltage of 1.00 Vpk is required to obtain strength data. This minimum voltage level increases with range as shown in Table 4.

The impulse printout will have the following form:

```
4 IMP 12:34:56.88
0.000156 V-SEC
+02.58V PK
```

This printout indicates that an impulse which deviated from the normal bus voltage with a strength of 0.000156 V-Sec and a peak voltage of 2.58 volts was detected on channel 4 at the time shown. The "+" preceding the impulse voltage indicates that the impulse was positive with respect to the "-" terminal on the 6002A rear panel.

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Figure 5 illustrates an impulse strength measurement.

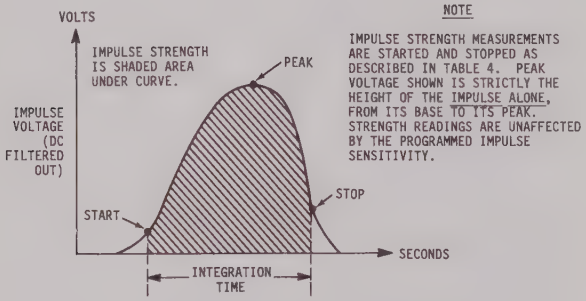
VOLTS
IMPULSE STRENGTH IS SHADED AREA UNDER CURVE.
PEAK
IMPULSE VOLTAGE (DC FILTERED OUT)
START
STOP
SECONDS
INTEGRATION TIME
NOTE
IMPULSE STRENGTH MEASUREMENTS ARE STARTED AND STOPPED AS DESCRIBED IN TABLE 4. PEAK VOLTAGE SHOWN IS STRICTLY THE HEIGHT OF THE IMPULSE ALONE, FROM ITS BASE TO ITS PEAK. STRENGTH READINGS ARE UNAFFECTED BY THE PROGRAMMED IMPULSE SENSITIVITY.

Figure 5. Impulse Strength Measurement

13.8 Printout Modes

Printout modes and calibration signals remain the same as in the standard 6002A described in paragraph 9.

14 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Technologies Customer Service Department and obtain an Authorizartion Number:

   Phone: 201-287-3680; TWX: 710-997-9553

2. Fill out the Repair/Service Order enclosed in this manual and ship it with the equipment to the Customer Service Department.

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation and maintenance should be performed only by qualified personnel.

TM-110385-3U

VOLUME 1

OPERATOR'S MANUAL

626-PA-6002C

DC MONITOR

NOTE: Refer to Volume 2 (Service Manual) of TM-110385-3U for maintenance data

1 May 1984

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DRANETZ

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626-PA-6002 DC MONITOR

1 INTRODUCTION

This technical manual provides operating instructions for the 626-PA-6002C DC Monitor Plug-in, hereinafter referred to as the 6002C. The 6002C is designed for installation in the Model 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in TM-106650U.

2 PURPOSE

The 6002C monitors disturbances on DC power buses. This single channel unit has an overall range of 25 to 600 VDC, programmable in three ranges. With thresholds programmed by the user, the 6002C stores, analyzes, classifies and prints out quantitative and qualitative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The 6002C monitors two types of disturbances: DC power bus transients and waveform disturbances. Power bus transients are divided into five display categories: overvoltage, undervoltage, voltage change, voltage surge and voltage sag. Waveform disturbances, identified as "impulses", include all conditions that cause the power bus waveform to deviate from an ideal (flat) waveform. The threshold value of each type of disturbance, above which detection and printout occurs, is operator programmable. Except for an automatic summary printout at the end of each day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of each day. This feature permits long term unattended operation.

The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

3 EQUIPMENT CHARACTERISTICS

The 6002C is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in any of the five slots of the Model 626 Universal Disturbance Analyzer. Technical specifications of the 6002C are listed in Table 1.

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Table 1. 626-PA-6002C Technical Specifications

Input	2-wire differential Z_{in} = 40 meg plus 40 pf (each side to ground)
Overall Voltage Ranges	25 to 150V 50 to 300V 100V to 600V
User set voltage lower spec limit (1V increments)	
150V Range	25V to 149V
300V Range	50V to 298V
600V Range	100V to 596V
User set voltage upper spec limit	
150V Range	26V to 150V
300V Range	52V to 300V
600V Range	104V to 600V
Voltage Change Sensitivity (1V increments)	
150V Range	1 to 15 volts
300V Range	2 to 30 volts
600V Range	4 to 60 volts
Voltage Measurement Accuracy	±1% of reading, ±0.5% of F.S.
Voltage Measurement Resolution	
150V Range	0.2V
300V Range	0.4V
600V Range	0.8V
Impulse Ranges (2 mSec to 1 uSec)	
150V Range	25 to 1000V
300V Range	50 to 2000V
600V Range	100 to 4000V

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Table 1. 626-PA-6002C Specifications (Contd.)

Impulse Thresholds (1 volt increments)	
150V Range	25 to 500V
300V Range	50 to 1000V
60V Range	100 to 2000V
Impulse Accuracy	+5% of reading +1% F.S. for half sinewave impulses 10 uSec in duration regardless of polarity or grounding. Error increases to +10% of reading, +1% F.S. at 5 uSec and 50 uSec pulse durations, and is typically -6dB at 2 mSec and 1 uSec pulse durations.

4 INSTALLATION

To install the 6002C in the mainframe, proceed as follows:

CAUTION: Be sure 626 is turned off and that all power connected to all the plug-in modules is turned off.

a. Position the top and bottom front corners of the plug-in module in the upper and lower tracks at the desired slot position at the rear of the mainframe.

b. Carefully slide the module into the mainframe until it is firmly seated.

c. Tighten the top and bottom captive screws to secure the module to the mainframe.

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5 CONNECTING DC POWER SOURCE TO MODULE

5.1 Connection Procedure

The 6002C is supplied with a barrier type terminal strip under a small cover located at the rear of the module. Proceed as follows:

a. Insert key in FUNCTION key switch on front panel of mainframe and set switch to OFF position.

b. Turn off DC power source that is to be monitored by the module.

c. Remove the terminal strip safety cover to expose the connections. Now connect the DC line to the three power terminals (two DC leads to upper two terminals and earth ground to the third terminal, as marked). When all connections have been made, be sure to replace the terminal block cover, then reapply DC power.

CAUTION: To avoid damaging the equipment, do not apply DC voltages in excess of 600V peak to the 6002C.

5.2 Circuit Applications

WARNING

Connection should only be performed by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18 (1 mm^2). For branch circuits with higher ampacity, refer to National Electric Code (ANSI CI-1975 Para. 240-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

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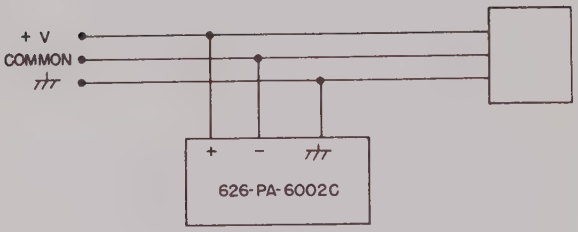
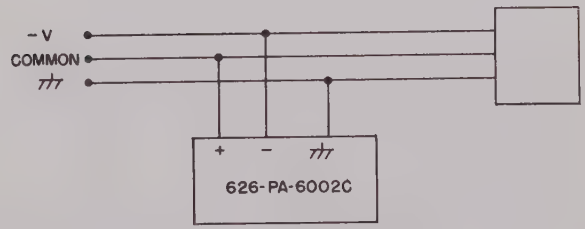


Connections to Positive DC Sources



Connection to Negative DC Sources

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5.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires careful attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidelines should be utilized.

1. To minimize spurious Impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of Impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment; i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade Potential Transformers for monitoring Impulses on high voltage power lines is not recommended. The limited frequency response of most Potential Transformers may result in substantial variation of Impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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6 OPERATING THE 6002C

6.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6002C operation are described in Table 2. Figure 1 shows the typical front panel controls on a Model 626. For a description of controls common to overall Model 626 operation, refer to Volume 1 of TM-106650U.

Table 2. 6002C Operating Controls

Item	Function
RANGE pushbutton and lamp	When lamp lights, user is cued to to depress RANGE pushbutton and enter the desired full scale voltage range (150, 300, or 600) via the numeric keyboard.
LO LIMIT pushbutton	When depressed, enables numeric keyboard to program low limit voltage.
HI LIMIT pushbutton	When depressed, enables numeric keyboard to program high limit voltage.
SENS pushbutton	When depressed, enables numeric keyboard to program voltage sensitivity value.
IMP SENS pushbutton	When depressed, enables numeric keyboard to program impulse voltage sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6002C memory.
DATA pushbutton	When depressed, produces data summary printout.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that channel.

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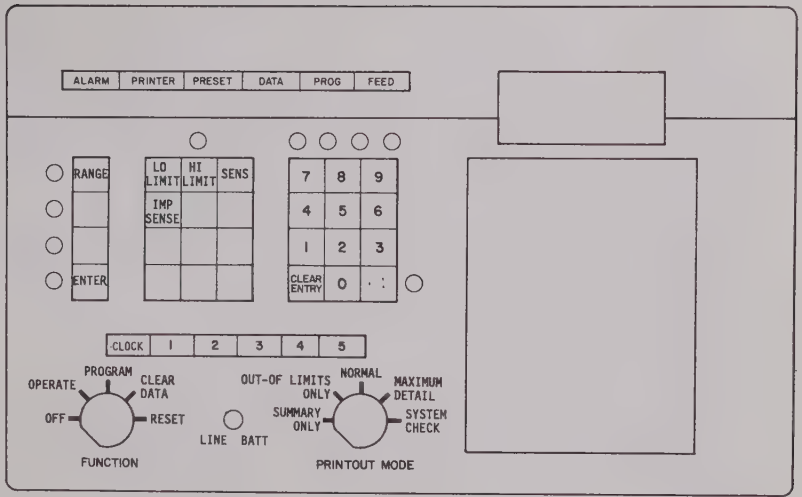

Figure 1. Typical Front Panel with 6002C Installed in Mainframe

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6.2 Programming Procedure

Assume it is desired to program a full scale range of 150V, a high limit of 125V, a low limit of 105V, voltage sensitivity of 2 volts and an impulse sensitivity of 100V. Voltage sensitivity sets the deviation from the present voltage value above or below which a detected value produces a recorded disturbance. For impulse measurements, the sensitivity corresponds to the absolute threhold, so that for an impulse sensitivity of 100 volts, a disturbance is recorded when impulse amplitude is greater than or equal to 100 volts.

For the example cited, program the 6002C as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that the red lamp next to the RANGE pushbutton lights. Depress the RANGE pushbutton.

d. Note that three yellow lamps above the numeric keyboard now light. Enter 150, using the keyboard. This selects the first full scale range (25 to 150V). As each digit is entered, one lamp goes out. If an error is made, depress CLEAR ENTRY and correct the entry.

e. When the full scale value has been programmed, the green lamp next to the ENTER pushbutton lights. Depress this pushbutton to enter the value. The full scale entry (RANGE F.S. 150V) will now be echoed back on the printout.

f. When the green ENTER indicator goes out, one red indicator above the center bank of pushbuttons lights. This indicates that another function may be programmed.

g. Depress the HI LIMIT pushbutton. Program the high limit value (125) as in step d.

h. When the green ENTER indicator lights, depress the ENTER pushbutton. The programmed high limit value will be echoed back on the printout.

i. Repeat steps f, g and h for the low limit value (105), using the LO LIMIT pushbutton.

j. Repeat steps f, g and h for the voltage sensitivity, using the SENS pushbutton and programming the voltage value as 02.

k. Repeat steps f, g and h for the impulse sensitivity (0100 volts) using the IMP SENS pushbutton. The completed program printout should take the following form:

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```
IMPULSE SENS          Ø100V
VOLTAGE SENS          ØØ2 V
V LOW LIMIT           105 V
V HIGH LIMIT          125 V
RANGE F. S.           150 V
```

NOTE

This instrument is designed to detect an invalid entry and to automatically shift high and low limits if range is changed without reprogramming the limits. For example, if the full scale value is selected as 150V and the user selects 153V as the low limit value, the printout ENTRY TOO HIGH will appear.

1. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

7 SELECTING THE FACTORY PRESET PROGRAM

NOTE: Custom Preset Option 103 allows the user to choose his/her own program setup for the PRESET function.

To select the program stored in hard memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. An example of this sequence appears below.

```
                IMPULSE SENS        Ø100 V
                VOLTAGE SENS        ØØ2 V
                V LOW LIMIT         105 V    (Factory Program)
                V HIGH LIMIT        125 V
                RANGE F.S.          150 V
                   626-PA-6002C
                      CH 1
(Read Up)                                    (Press PRESET)
                IMPULSE SENS       Ø100 V
                VOLTAGE SENS        ØØ5V
                V LOW LIMIT         125 V    (Operator
                V HIGH LIMIT        140 V     Program)
                RANGE F. S.         150 V
                   626-PA-6002C
                      CH 1
                PROGRAM SUMMARY

                 PROGRAM MODE
```

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8 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6002C, it is recorded and displayed in characteristic manner.

8.1 Overvoltage

An overvoltage condition exists when the monitored DC bus voltage exceeds the user-specified upper limit for more than 2.55 seconds. The beginning of an overvoltage condition is indicated by a printout such as the following:

```
4    HIGH    12:34:56.78
```

where 4 is the channel number and time is given in hours, minutes and seconds (to .01 sec resolution).

When the DC voltage recovers to normal, a printout such as the following occurs:

```
4    NORM    12:36:14.56
     145.2    V    MAX
```

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

8.2 Undervoltage

An undervoltage condition exists when the monitored power line voltage remains below the user-specified lower limit for more than 2.55 seconds. The beginning of an undervoltage condition is indicated by a printout such as the following:

```
4    LOW    10:09:23:.34
```

When the voltage returns to normal level, a message such as the following is printed:

```
4    NORM   10:09:23.45
     96.4 V   MIN
```

indicating when normal voltage was restored and the value of the lowest voltage reached during the undervoltage interval.

8.3 Voltage Change

A voltage change printout is triggered when the line voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user-selected voltage that varies with the full scale range selected. For the 150V range, a sensitivity of 1 to 15V may be selected. The following example shows several voltage change printouts.

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Printout	Remarks
2 INC Ø1:Ø2:34.56 138.6 V	Voltage increased to 138.6V at time shown
2 DEC Ø1:Ø2:34.56 135.1 V	Voltage decreased to 135.1V at time shown

8.4 Voltage Surge

A Voltage Surge is defined as a DC voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
3    HIGH    12:34:5Ø.49
```

When the DC voltage returns to a normal level following a Surge condition, a message such as the following will be printed.

```
3    NORM    12:34:51.59
     135.2  V  MAX
     SURGE 1.1Ø  SEC
```

In this case, the time at which the voltage returned to normal is shown as well as the maximum voltage reached and the surge duration.

8.5 Voltage Sag

A Voltage Sag is defined as a line voltage that decreases below the user-selected lower limit and then returns to an in-tolerance condition in less than 2.56 seconds. Sag printouts take the same form as surge printouts, with the term SAG replacing the term SURGE, and the term MIN replacing the term MAX.

8.6 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 300 Hz to 500 kHz range. An impulse type disturbance produces a printout such as the following:

```
2    IMP    1Ø:12:13:45
     +Ø139   V  PK
```

This printout indicates that an impulse which deviated from normal DC voltage by +139 volts peak was detected on Channel 2 at the time shown.

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9 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise.

The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in Channel 1 and that the limits for Channel 1 were programmed as follows:

RANGE F.S.	150 V
V LOW LIMIT	105 V
V HIGH LIMIT	125 V
V SENSITIVITY	2 V

The example printouts are referenced to figures 2 and 3 which illustrate overvoltage and voltage sag disturbances, respectively.

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

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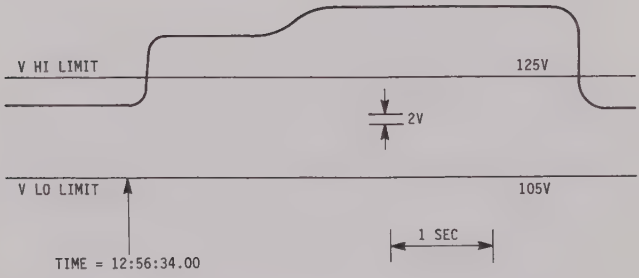

Figure 2. Overvoltage Disturbance (6002C)

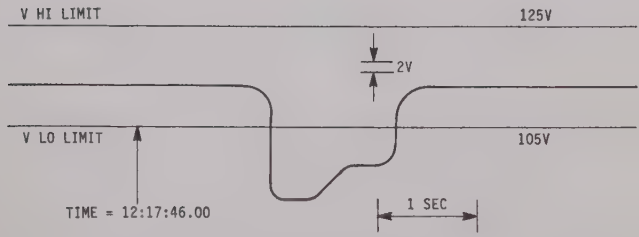

Figure 3. Voltage Sag Disturbance (6002C)

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```
1   NORM 12:56:38.51
    139.1  V  MAX

1   HIGH 11:56:34.21
```

Printout of overvoltage (fig. 2) in OUT-OF-LIMITS ONLY mode

```
1   NORM  11:56:38.51
    139.1  V  MAX

1   DEC  12:56:38.50
    130.2  V

1   INC  12:56:35.78
    137.3  V

1   INC  12:56:35.62
    135.3 V

1   INC  12:56:35.40
    133.3 V

1   INC  12:56:34.22
    131.3 V

1   INC  12:56:34.21
    129.2 V

1   HIGH  12:56:34.21
```

(Read Up) ↑

Printout of overvoltage (fig. 2) in NORMAL mode

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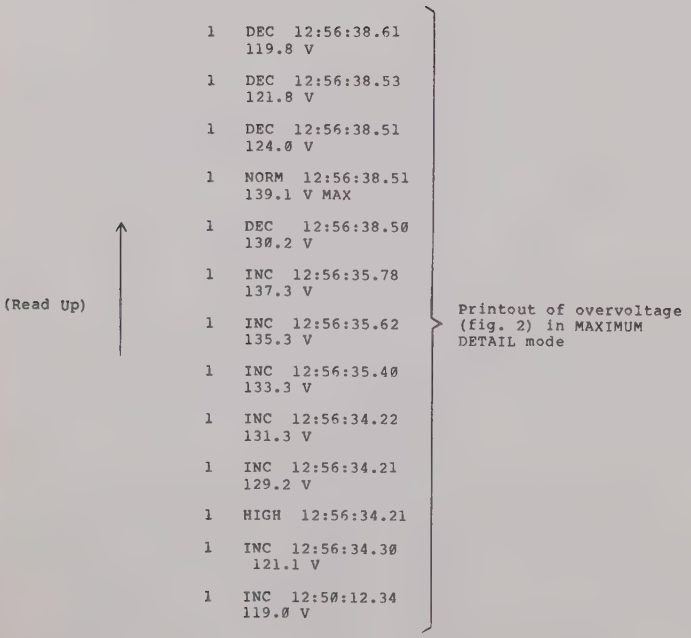

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```
1   NORM  12:17:48.61
    090.1  V  MIN
    SAG 1.25  SEC

1   LOW  12:17:47.36
```

Printout of voltage sag (fig. 3) in OUT-OF-LIMITS ONLY mode

```
1   NORM  12:17:48.61
    090.1  V  MIN
    SAG  1.25  SEC

1   INC  12:17:48.60
    103.1 V

1   INC  12:17:48.55
    098.0 V

1   INC  12:17:48.05
    096.0 V

1   INC  12:17:48.96
    094.0 V

1   DEC  12:17:47.39
    091.9  V

1   DEC  12:17:47.37
    094.1 V

1   DEC  12:17:47.36
    101.3 V

1   LOW  12:17:47.36
```

(Read Up)

Printout of voltage sag (fig. 3) in NORMAL mode

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```
1   INC  12:17:48.86
    112.1 V

1   INC  12:17:48.69
    110.1 V

1   INC  12:17:48.62
    108.1 V

1   INC  12:17:48.61
    105.9 V

1   NORM  12:17:48.61
    090.1 V MIN
    SAG 1.25 SEC

1   INC  12:17:48.60
    103.1 V

1   INC  12:17:48.55
    098.0 V

1   INC  12:17:48.05
    096.0 V

1   INC  12:17:47.96
    094.0 V

1   DEC  12:17:47.39
    091.9 V

1   DEC  12:17:47.37
    094.1 V

1   DEC  12:17:47.36
    101.3 V

1   LOW  12:17:47.36

1   DEC  12:17:47.35
    110.8 V

1   INC  12:16:32.15
    113.0 V
```

(Read Up)

Printout of voltage sag (fig. 3) in MAXIMUM DETAIL mode

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9.1 System Check

When the PRINTOUT MODE switch is set to SYSTEM CHECK a source of precise signals is applied to the front end circuitry of the 6002C. Any inputs that are connected at this time will be automatically disconnected for the system check period. These signals fully verify the operational integrity of the module. The signals and the allowable tolerance levels are described below.

9.2 System Check Signals

Impulse: +160V pk

Voltage: 120.0 VDC

9.3 System Check

F.S. Range	Impulse	Voltage
150	134 to 186 Vpk	118.0 to 122.0 VDC
300	124 to 196 Vpk	117.3 to 122.7 VDC
600	104 to 216 Vpk	115.8 to 124.2 VDC

10 STANDARD ACCESSORIES

Model No.	Part No.	Quantity	Description
626-PA-6002C	TM-110385-3U Vol. 1	1	Operator's Manual

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11 626 MODULE CAPACITY

The 626 standard mainframe has an upper limit of the total load rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Rating
626-PA-6001	2 Units
626-PA-6001 With Extra Option Board	3 Units
626-PA-6002	2 Units
626-PA-6003	4 Units
626-PA-6006	2 Units
626-PA-6007	1 Unit
626-PA-6008	2 Units
626-PA-6009	4 Units
626-PA-6011	1 Unit
626-PA-6012	3 Units
626-PA-6014	1 Unit
626-PA-6015	4 Units

When selecting modules for installation in any mainframe, simply verify that the sum of the load ratings of the installed modules does not exceed 20.

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12 IMPULSE DURATION OPTION, OPTION 101 FOR 626-PA-6002C PLUG-IN (NOT COMPATIBLE WITH OPTION 102)

12.1 Introduction

The following paragraphs describe the differences between the 6002C with Option 101 and the standard 6002C.

NOTE

The following data supersedes that found in previous paragraphs of this manual unless otherwise stated.

12.2 Purpose

Option 101 is designed to provide information on impulse duration; it has no effect on the measurements made by the standard 6002C described in paragraph 2.

12.3 Equipment Characteristics

Technical specifications for Option 101 are listed in Table 3. All specifications for the 6002C, listed in Table 1, still apply.

Table 3. 626-PA-6002C Option 101 Technical Specifications

IMPULSE DURATION

Range: 1 uSec to 1023 uSec

Accuracy: ±6% of reading ±0.3% F.S., for 1/2 sinewave pulses up to 100 uSec duration greater than 100 Vpk.* Typically -10% at 200 uSec, -20% at 400 uSec, -50% at 1000 uSec.

* 100 Vpk on 150 Vdc Range
200 Vpk on 300 Vdc Range
400 Vpk on 600 Vdc Range

Timing reference Points: Start at 25V** - Stop at 30% of Vpk.

Minimum Impulse Voltage: 50 Vpk on 150 Vdc Range
100 Vpk on 300 Vdc Range
200 Vpk on 600 Vdc Range

** 25V on 150 Vdc Range
50V on 300 Vdc Range
100V on 600 Vdc Range

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12.4 Installation in Mainframe

The module is installed in the mainframe in the same manner as the standard 6002C described in paragraph 4.

12.5 Connections to the Module

Connecting the 6002C to the line to be monitored is the same as described in paragraph 5.

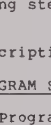
12.6 Operating the 6002C with Option 101

Operation of the 6002C with Option 101 requires no additional programming steps. Programming is the same as described in paragraph 6.2.

12.7 Description of Data Printouts

PROGRAM SUMMARY

When the Program Summary key (designated "PROG") is depressed, the module will be identified as a 626-PA-6002CR1 as in the following example.




```
IMPULSE SENS    0100V
VOLTAGE SENS    002V
V LOW LIMIT     105V
V HIGH LIMIT    125V
RANGE F.S.      150V
    626-PA-6002CR1
        CH1
11/17/83   14:45:31
    PROGRAM SUMMARY
```

IMPULSE

When used with the 150V range, a minimum impulse voltage of 50 Vpk is required to obtain duration data. This minimum voltage level increases with range, as shown in Table 3.

The impulse printout will have the following form:

```
4 IMP 12:34:56.88
+ 0257V PK, 089uS
```

This printout indicates that an impulse which deviated from the normal bus voltage for 89 microseconds with a peak voltage of 257 volts was detected on channel 4 at the time shown. The "+" preceding the impulse voltage indicates that the impulse was positive with respect to the "-" terminal on the 6002C rear panel.

Figure 4 illustrates an impulse duration measurement.

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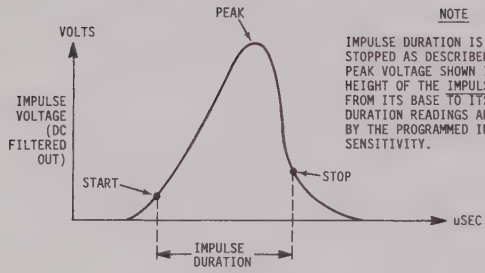
PEAK
VOLTS
IMPULSE VOLTAGE (DC FILTERED OUT)
START
STOP
uSEC
IMPULSE DURATION
NOTE
IMPULSE DURATION IS STARTED AND STOPPED AS DESCRIBED IN TABLE 3. PEAK VOLTAGE SHOWN IS STRICTLY THE HEIGHT OF THE IMPULSE ALONE, FROM ITS BASE TO ITS PEAK. DURATION READINGS ARE UNAFFECTED BY THE PROGRAMMED IMPULSE SENSITIVITY.

Figure 4. Impulse Duration Measurement

12.8 Printout Modes

Printout modes and calibration signals remain the same as in the standard 6002C described in paragraph 9.

13. IMPULSE STRENGTH OPTION, OPTION 102 FOR 626-PA-6002C PLUG-IN (NOT COMPATIBLE WITH OPTION 101)

13.1 Introduction

The following paragraphs describe the differences between the 6002C with Option 102 and the standard 6002C.

NOTE

The following data supersedes that found in previous paragraphs unless otherwise stated.

13.2 Purpose

Option 102 is designed to provide information on impulse strength (volt-second area); it has no effect on the measurements made by the standard 6002C as described in paragraph 2.

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13.3 Equipment Characteristics

Technical specifications for Option 102 are listed in Table 4. All specifications for the 6002C, listed in Table 1, still apply.

Table 4. 626-PA-6002C Option 102 Technical Specifications

IMPULSE STRENGTH

Ranges: 150V F.S. Range 0.0002 to 0.2046 V-Sec
300V F.S. Range 0.0004 to 0.4092 V-Sec
600V F.S. Range 0.0008 to 0.8184 V-Sec

Accuracy: ±10% of reading, ±0.1% of F.S. for 1/2 sinewave pulses up to 100 uSec duration greater than 100 Vpk*. Typically -20% at 200 uSec, -50% at 500 uSec.

* 100 Vpk on 150 Vdc Range
200 Vpk on 300 Vdc Range
400 Vpk on 600 Vdc Range

Timing Reference Points: Start at 25V** - stop at 30% of Vpk.

** 25V on 150 Vdc Range
50V on 300 Vdc Range
100V on 600 Vdc Range

Minimum Impulse Voltage: 50 Vpk on 150 Vdc Range
100 Vpk on 300 Vdc Range
200 Vpk on 600 Vdc Range

13.4 Installation in Mainframe

The module is installed in the mainframe in the same manner as the standard 6002C described in paragraph 4.

13.5 Connections to the Module

Connecting the 6002C to the line to be monitored is the same as described in paragraph 5.

13.6 Operating the 6002C with Option 102

Operation of the 6002C with Option 102 requires no additional programming steps. Programming is the same as described in paragraph 6.2.

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13.7 Description of Data Printouts

The only printouts affected by the addition of Option 102 are those for module identification and impulse data.

PROGRAM SUMMARY

When the Program Summary key (designated "PROG") is depressed, the module will be identified as a 626-PA-6002CR2 as in the following example.

```
                IMPULSE SENS    0100V
          ^     VOLTAGE SENS    002V
(Read     |     V LOW LIMIT     105V
  up)     |     V HIGH LIMIT    125V
          |     RANGE F.S.      150V
                    626-PA-6002CR2
                        CH1
                11/17/83   14:51:19
                    PROGRAM SUMMARY
```

IMPULSE

When used with the 150 Vdc range, a minimum impulse voltage of 50 Vpk is required to obtain strength data. This minimum voltage level increases with range as shown in Table 2.

The impulse printout will take the following form:

```
4 IMP 12:34:56.88
  0.0156 V-SEC
  +  247V PK
```

This printout indicates that an impulse which deviated from the normal bus voltage with a strength of 0.0156V-Sec and a peak voltage of 257 volts was detected on channel 4 at the time shown. The "+" preceding the impulse voltage indicates that the impulse was positive with respect to the "-" terminal on the 6002C rear panel.

Figure 5 illustrates an impulse strength (area) measurement.

13.8 Printout Modes

Printout modes and calibration signals remain the same as in the standard 6002C described in paragraph 9.

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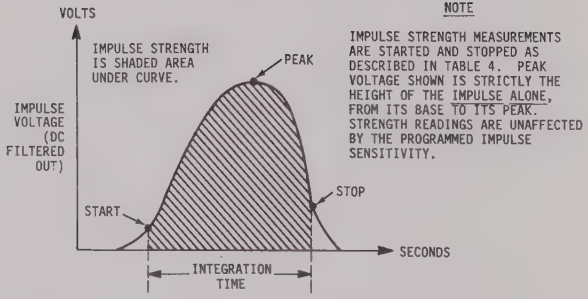
VOLTS
IMPULSE STRENGTH IS SHADED AREA UNDER CURVE.
PEAK
IMPULSE VOLTAGE (DC FILTERED OUT)
START
STOP
SECONDS
INTEGRATION TIME
NOTE
IMPULSE STRENGTH MEASUREMENTS ARE STARTED AND STOPPED AS DESCRIBED IN TABLE 4. PEAK VOLTAGE SHOWN IS STRICTLY THE HEIGHT OF THE IMPULSE ALONE, FROM ITS BASE TO ITS PEAK. STRENGTH READINGS ARE UNAFFECTED BY THE PROGRAMMED IMPULSE SENSITIVITY.

Figure 5. Impulse Strength Measurement

14 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Technologies Customer Service Department and obtain an Authorization Number.

   Phone No: 201-287-3680; TWX 710-997-9553

2. Fill out the Repair/Service Order enclosed in this manual and ship it with the equipment to the Customer Service Department.

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-11Ø235U

VOLUME 1

OPERATOR'S MANUAL

626-PA-6ØØ3

3-PHASE AC MONITOR

NOTE: Refer to Volume 2 (Service Manual) of TM-11Ø235U for maintenance data

1 May 1984
(Rev. 1 July 1984)

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626-PA-6003 3-PHASE AC MONITOR

1 INTRODUCTION

This manual provides instructions for the 626-PA-6003 Plug-in, hereinafter referred to as the 6003, used in the Model 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in TM-106650U.

2 PURPOSE

The 6003 monitors disturbances on 3-phase AC power lines with either 50 or 60 Hz nominal frequency. Each phase is monitored on a single voltage range of 0 to 600 V RMS. With thresholds programmed by the user, the 6003 monitors both short and long term power line disturbances. With this plug-in, the unit stores, analyzes, classifies and prints out quantative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The plug-in monitors any 3-phase power line whose RMS values range from a low value of 0 volts to as high as 600 volts. Three types of disturbances are monitored by the 6003: power line frequency, power frequency transients and waveform disturbances. Power frequency transients are divided into five display categories: overvoltage, undervoltage, voltage change, voltage surge and voltage sag. Waveform disturbances, identified as "impulses", include all conditions that cause the power line waveform to deviate from an ideal waveform. The 6003 measures the peak amplitude of impulses, their polarity and duration. The threshold value of each type of disturbance, as well as the line frequency, above which detection and printout occurs is operator programmable. (All threshold settings are common to all three line phases.) Except for an automatic summary printout at the end of day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of the day. This feature permits long term unattended operation.

The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

NOTE: Frequency measurements are derived from phase A only. Therefore, if single-phase monitoring is desired, phase A should be used.

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3 APPLICATIONS

When installed in the 626 mainframe, the 6003 provides the capability of monitoring and evaluating power system performance. Among its typical applications are the following:

a. To determine the effect of power systems operation on equipment malfunction. The time-referenced power fault disturbance record produced by the instrument permits rapid correlation of errors, outages, and equipment damage in computer, industrial process controls, digital communications equipment, medical monitoring apparatus, and so forth, to power line faults.

b. To perform pre-installation site surveys. The 6003 can be used to determine the adequacy of existing power lines intended to support critical electrical equipment. Anticipation of power problems saves time, money, and future trouble.

c. For diagnostic evaluation of power system performance. The portable instrument, particularly well suited for field use, is ideal for determining the probable causes of, and remedies for, power line disturbances.

d. For monitoring life test racks. The printout produced by the instrument provides a clear record of the quality of power supplied during unattended periods.

4 EQUIPMENT CHARACTERISTICS

The 6003 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in one of four slots of the Model 626 Universal Disturbance Analyzer. Technical specifications of the 6003 are presented in Table 1.

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Table 1. 626-PA-6003 Technical Specifications

Input	2 wire differential Z_{in} = 40 Megohms plus 40 pf ((each side to ground)
Input Voltage Range	50-600V RMS
Lower Limit of User-Set Voltage (V_{LOW})	50V to 599V
Upper Limit of User-Set voltage (V_{HIGH})	600V to 51V
Voltage Change Sensitivity (V_{SENS}) (1V Increments)	2 to 60V
Line Voltage Measurement Resolution	0.2V
Line Voltage Measurement Accuracy	±1% of reading, ±0.2% of full scale (75V to 600V)
Line Frequency Range Resolution Accuracy	 45-65 Hz ±0.1 Hz ±0.1 Hz
Impulse Range	50-4000V Pk (1-2000 uSec)
Impulse Peak Resolution	1V
Impulse Accuracy	±10% of reading ±1% F.S. (5 uSec-50 uSec.) (decreasing to ±6 dB from 1 uSec to 2 mSec) 100V-4000V
Impulse Duration Range	1 uSec to 2 mSec
Impulse Duration Resolution	1 uSec

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5 INSTALLATION

5.1 Selection of Nominal Operating Frequency

The 6003 has switches which are factory set so that the measurements are optimized for a nominal frequency of either 50 or 60 Hz. Figure 1 below shows the location of these switches on the Analog board of the module. Dots on switches on the figure indicate which side of the switch is to be depressed for 60 Hz. For 50 HZ operation, simply reverse all switches.

5.2 Installation of 6003 in Mainframe

CAUTION: Be sure that 626 is turned off and that all power connected to all plug-in modules is turned off.

A 6003 module may be installed in any of the plug-in slots as follows:

a. With the rear panel markings reading correctly, carefully slide the module into the desired slot, with the Digital board within the card-guide tracks until it is firmly seated.

b. Tighten the top and bottom captive screws to secure the module into the mainframe.

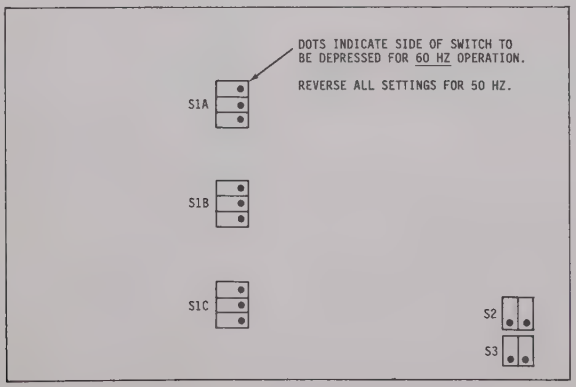

Figure 1. Analog Board Switch Locations

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6 CONNECTING POWER SOURCE TO MODULE

6.1 Connection Procedure

The 6003 is equipped with either three rear panel AC connectors, or a barrier block. Inputs include phase A, B, and C. Connectors must be wired in accordance with the rear panel connector markings (AC high, AC low, and earth ground from top to bottom).

a. Turn the 626 OFF by inserting thekey in FUNCTION key switch on front panel of mainframe and setting the switch to the OFF position.

b. Turn off power source that is to be monitored by the module.

c. Make all connections to the 6003 module first. If the 6003 has been supplied with connectors, merely insert the mating connector, supplied with the unit, until a "click" is heard.

   If the 6003 has been supplied with a barrier block, make all connections to the barrier block first, then be sure to replace the barrier block cover. DO NOT PROCEED UNTIL PART C IS COMPLETE.

d. Make the desired connections to the power source to be monitored.

e. Power up the 626 by turning the FUNCTION Key Switch to the OPERATE position.

f. Turn on power source to be monitored.

WARNING: Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electric Code (ANSI C1) and/or any other requirments applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

CAUTION: To avoid damaging the equipment, do not apply AC voltages in excess of 600V RMS to any AC phase input (A,B, or C) of the 6003.

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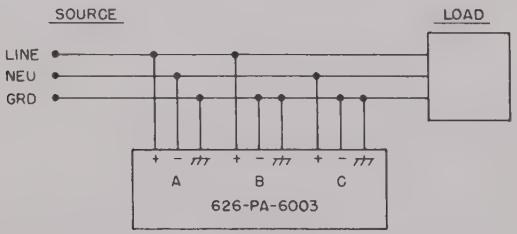
6.2 Circuit Applications

WARNING

Connection should only be performed by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18. (1 mm^2). For branch circuits with higher ampacity, refer to National Electric Code (ANSI C1-1975 Para. 240-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

The 30 AC monitor for 45-65 Hz may be used for 30 Wye, 30 Delta, or for up to three separate AC signals. It may be used by itself to do Normal Mode/Common Mode analysis on 1 phase lines, or in combination with a 626-PA-6006 to do Normal Mode/Common Mode analysis oon a 3 phase wye line.



1 Phase Normal Mode/Common Mode

Readings:

Channel A: LINE-Neutral
Channel B: LINE-Ground
Channel C: Neutral-Ground

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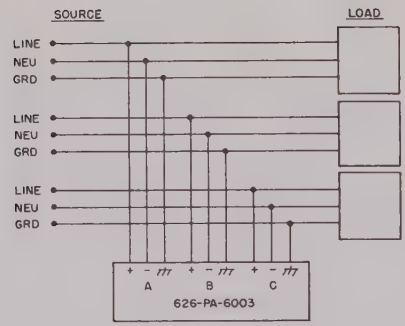
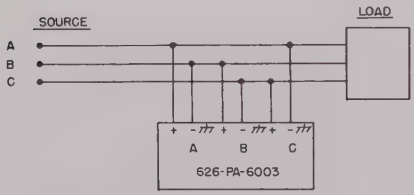


3 Separate AC Lines

Notes

1. All Channels are monitored independently.
2. All line frequencies must be the same.
3. All 3 channels will have same program set-up.



3 Phase Delta

Notes

1. Delta may be grounded or ungrounded
2. Set 626-PA-6003 to monitor line-to-line voltage, e.g.: For 240 volt delta, set High and Low Limits to either side of 240 VAC.

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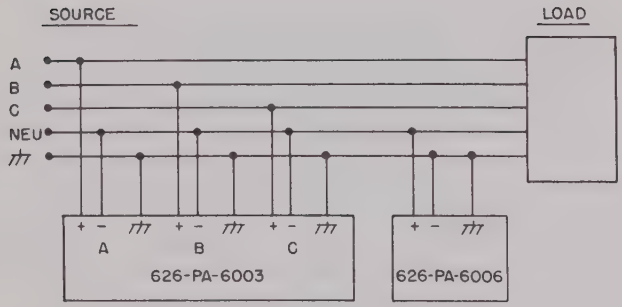

3 Phase Wye

Notes

1. 626-PA-6006 is added to perform Neutral-Ground (COMMON mode) monitoring.
2. Wye distribution is normally monitored LINE-to-Neutral, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 120.
3. To monitor wye system line-to-line, set High and Low Limits to either side of higher stated voltage, and connect to 626-PA-6003 as though lines A, B, and C were from a delta, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 208.

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6.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires careful attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidelines should be utilized.

1. To minimize spurious Impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of Impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment; i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade Potential Transformers for monitoring Impulses on high voltage power lines is not recommended. The limited frequency response of most Potential Transformers may result in substantial variation of Impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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7 OPERATING THE 6003

7.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6003 operation are described in Table 2. Figure 2 shows the typical front panel controls on a Model 626 that are associated with a 6003 module. For a description of controls common to overall Model 626 operation, refer to Volume 1 of TM-106650U.

7.2 Programming Procedure

Assume it is desired to program a high limit of 125V, a low limit of 105V, voltage sensitivity of 2 volts, frequency sensitivity of 0.2 Hz and an impulse sensitivity of 50V. Voltage and frequency sensitivity sets the deviation from the present value above or below which a detected value produces a recorded disturbance.

For impulse measurements, the sensitivity corresponds to the absolute threshold, so that for an impulse sensitivity of 25 volts, a disturbance is recorded when impulse amplitude rises above 25 volts.

> NOTE: It is recommended that the HI and LO limits be set to at least 3V (respectively) from the nominal voltage being measured. For example, if monitoring 120V, the high and low limits should be 117V (or less) and 123V (or more), respectively.

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Figure 2. Typical Front Panel With 6003 Installed in Mainframe

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Table 2. 6003 Operating Controls

Item	Function
LO LIMIT pushbutton	When depressed, enables numeric keyboard to program low limit voltage.
HI LIMIT pushbutton	When depressed, enables numeric keyboard to program high limit voltage.
SENS pushbutton	When depressed, enables numeric keyboard to program voltage sensitivity value.
IMP SENS pushbutton	When depressed, enables numeric keyboard to program impulse voltage sensitivity value.
F SENS pushbutton	When depressed, enables numeric keyboard to program frequency sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6003 memory.
DATA pushbutton	When depressed, produces data summary printout.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that channel.

For the example cited, program the 6003 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that a cueing indicator above the center bank of pushbuttons lights. This indicates that a function may be programmed.

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d. Depress the HI LIMIT pushbutton. Program the high limit value (125), using the keyboard.

e. When the ENTER indicator lights, depress the ENTER pushbutton. The programmed high limit value will be echoed back on the printout and the ENTER indicator will go out.

f. Repeat steps c, d and e for the low limit voltage (lØ5V) using the LO LIMIT pushbutton.

g. Repeat steps c, d and e for the voltage sensitivity, using the SENS pushbutton and programming the voltage value as Ø2.

h. Repeat steps c, d and e for the frequency sensitivity (Ø.2 Hz), using the F SENS pushbutton and programming the value as Ø.2.

i. Repeat steps c, d and e for the impulse sensitivity (ØØ5Ø volts), using the IMP SENS pushbutton. The completed program printout should take the following form:

```
IMPULSE SENS          ØØ5ØV
FREQ SENS           ØØ.2 HZ     ↑
VOLTAGE SENS          ØØ2 V     |   (Read Up)
V LOW LIMIT           1Ø5 V     |
V HIGH LIMIT          125 V
     626-PA-6ØØ3
         CH 4
```

NOTE

The instrument is designed to detect an invalid entry and to automatically shift high and low limits.

j. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

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8. SELECTING THE FACTORY/OPTION 101 PRESET PROGRAM

NOTE: Custom Preset Option 101 allows the user to choose his/her own program setup for the PRESET function

To select the program stored in hard memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. An example of this sequence appears below.

```
IMPULSE SENS 0100V
FREQ SENS  00.5 HZ
VOLTAGE SENS  002V
V LOW LIMIT  105 V
V HIGH LIMIT 102 V
    626-PA-6001                    Factory
        CH 1                       Program
PROGRAM SUMMARY
(Read Up)                          Press PRESET

IMPULSE SENS 0050V
FREQ SENS  00.2 HZ                 Operator
VOLTAGE SENS 002 V                 Program
V LOW LIMIT  105 V
V HIGH LIMIT 125 V
    626-PA-6003
        CH 1
PROGRAM SUMMARY
```

9 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6003, it is recorded and displayed in characteristic manner.

9.1 Overvoltage

An overvoltage condition exists when the monitored power line voltage exceeds the user-specified upper limit for more than 2.55 seconds. An overvoltage condition is indicated by a printout such as the following:

```
4B  HI   09:46:07.11
```

where 4 is the channel number, B is the phase and time is given in hours, minutes and seconds (to .01 sec resolution).

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When the line voltage recovers to normal, a printout such as the following occurs:

```
4B  NOR   Ø9:46:15.2Ø

    148.6  V  MAX
```

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

9.2 Undervoltage

An undervoltage condition exists when the monitored power line voltage remains below the user-specified lower limit for more than 2.55 seconds. An undervoltage condition is indicated by a printout such as the following:

```
4C  LO   Ø9:46:15.2Ø
```

When the line voltage returns to normal level, a message such as the following is printed:

```
4C  NOR   Ø9:46:18.45

    36.4  V  MIN
```

indicating when normal voltlage was restored and the value of the lowest voltage reached during the undervoltage interval.

9.3 Voltage Change

A voltage change printout is triggered when the line voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user-selected integral voltage between one and 15 volts for a 115-volt line. The following example shows several voltage change printouts:

Printout	Remarks
2C INC Ø1:Ø2:34.56 115.4 V	Phase C voltage in Channel 2 increased to 115.4V at time shown
3A DEC Ø1:Ø2:34.56 1Ø9.2 V	Phase A voltage in Channel 3 decreased to 1Ø9.2V at time shown

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9.4 Voltage Surge

A Voltage Surge is defined as a line voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
4B   HI   09:45:33.15
```

When the line voltage returns to a normal level following a Surge condition, a message such as the following will be printed:

```
4B   NOR   09:45:33.38
     128.2  V  MAX
     SURGE 0.23 SEC
```

In this case, the time at which the voltage returned to normal is shown as well as the maximum voltage reached and the surge duration.

9.5 Voltage Sag

A voltage Sag is defined as a line voltage that decreases below the user-selected lower limit and then returns to an in-tolerance condition in less than 2.56 seconds. Sag printouts take the same form as surge printouts, with the term SAG replacing the term SURGE, and the term MIN replacing the term MAX.

NOTE

Voltage inputs less than 25V RMS will be printed out as 0.0V on the 6003.

9.6 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 300 Hz to 500 kHz range. An impulse type disturbance produces a printout such as the following:

```
2A IMP 10:12:13.45
 +0139 V, 0010 US
```

This printout indicates that an impulse which deviated from normal line voltage by +139 volts peak and whose duration was 10 microseconds was detected on phase A of Channel 2 at the time shown. The impulse magnitude is measured with respect to the instantaneous point on the power frequency sinewave at which it occurs. Impulse polarity is referenced to "+" and "-" markings on rear panel.

9.7 Frequency Change

A frequency change printout is triggered when the line frequency changes more than a preselected amount from the last printed value. The

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frequency change sensitivity is a user-selected value between 0.2 Hz and 3.0 HZ in 0.1 HZ increments. The following example shows several frequency change printouts.

```
3  FRQ 10:16:27.02
   060.5 HZ
3  FRQ 10:16:24.32
   060.0 HZ
3  FRQ 10:16:17.02
   059.5 HZ
```

10 SYSTEM CHECK

When the PRINTOUT MODE switch is set to SYSTEM CHECK, a source of precise signals is applied to the front end circuitry of the 6003. Any inputs connected at this time will be automatically disconnected during the system check period. Successful measurement of these signals verifies that the module is fully operational. Expected system check measurement results and allowable tolerances are listed below.

AC Voltage	196.0 - 204.0 Volts
Impulse Peak	2700 - 3300 Volts
Impulse Duration	360 - 440 uSec
Frequency	59.8 - 60.2 Hz

11 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise. The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in phase A of Channel 1 and that the limits for Channel 1 were programmed as follows:

V LOW LIMIT	105 Vrms
V HIGH LIMIT	125 Vrms
V SENSITIVITY	2 Vrms

The example printouts are referenced to figures 3 and 4 which illustrate overvoltage and voltage sag disturbances, respectively.

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

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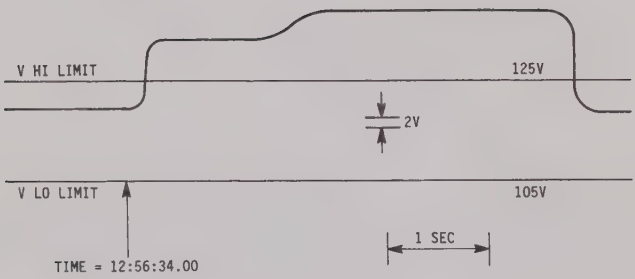

Figure 3. Overvoltage Disturbance (6003)

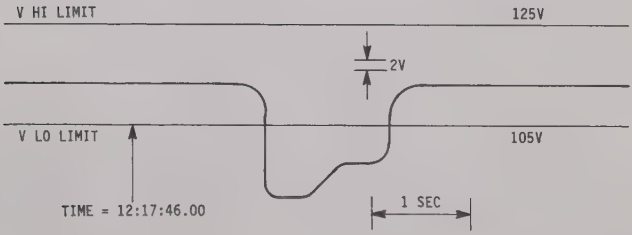

Figure 4. Voltage Sag Disturbance (6003)

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```
     1A  NOR   12:56:38.51
               139.1  V  MAX
     1A  HI    12:56:34.21
```

Printout of overvoltage (fig. 3) in OUT-OF LIMITS ONLY mode

```
     1A  NOR   12:56:38.51
         139.1  V  Max

     1A  DEC   12:56:38.50
         130.2  V

     1A  INC   12:56:35.78
         137.3 V

(Read 1A  INC   12:56:35.62
 Up)     135.3 V

     1A  INC   12:56:35.40
         133.3 V

     1A  INC   12:56:34.22
         131.3 V

     1A  INC   12:56:34.21
         129.2 V

     1A  HI    12:56:34.21
```

Printout of overvoltage (fig. 3) in NORMAL mode

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```
    1A  DEC   12:56:38.61
        119.8 V

    1A  DEC   12:56:38.53
        121.8 V

    1A  DEC   12:56:38.51
        124.0 V

    1A  NOR   12:56:38.51
        139.1 V  MAX

    1A  DEC   12:56:38.50
        130.2 V

    1A  INC   12:56:35.78
        137.3 V
(Read
  Up) 1A  INC   12:56:35.62
        135.3 V

    1A  INC   12:56:35.40
        133.3 V

    1A  INC   12:56:34.22
        131.3 V

    1A  INC   12:56:34.21
        129.2 V

    1A  HI    12:56:34.21

    1A  INC   12:56:34.20
        121.1 V

    1A  INC   12:50:12.34
        119.0 V
```

Printout of overvoltage (fig. 3) in MAXIMUM DETAIL mode

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```
1A  NOR   12:17:48.61
    090.1 V MIN
    SAG 1.25 SEC

1A  LO    12:17:47.36
```

Printout of voltage sag (fig. 4) in OUT-OF-LIMITS ONLY mode.

```
1A  NOR   12:17:48.61
    090.1 V MIN
    SAG 1.25 SEC

1A  INC   12:17:48.60
    103.1 V

1A  INC   12:17:48.55
    098.0 V

1A  INC   12:17:48.05
    096.0 V

1A  INC   12:17:47.96
    094.0 V

1A  DEC   12:17:47.39
    091.9 V

1A  DEC   12:17:47.37
    094.1 V

1A  DEC   12:17:47.36
    101.3 V

1A  LO    12:17:47.36
```

(Read Up)

Printout of voltage sag (fig. 4) in NORMAL mode.

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```
1A  DEC   12:17:48.86
    112.1 V

1A  INC   12:17:48.69
    110.1 V

1A  INC   12:17:48.62
    108.1 V

1A  INC 12:17:48.61
    105.9 V

1A  NOR   12:17:48.61
    090.1 V MIN
    SAG  1.25  SEC

1A  INC   12:17:48.60
    103.1 V

1A  INC   12:17:48.55
    098.0 V

1A  INC   12:17:48.05
    096.0 V

1A  INC   12:17:47.96
    094.0 V

1A  DEC   12:17:47.39
    091.9 V

1A  DEC   12:17:47.37
    094.1 V

1A  DEC   12:17:47.36
    101.3 V

1A  LO    12:17:47.36

1A  DEC   12:17:47.35
    110.8 V

1A  INC   12:16:32.15
    113.0 V
```

(Read (up)

Printout of voltage sag (fig. 4) in MAXIMUM DETAIL mode

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12 626 MODULE CAPACITY

The 626 standard mainframe has an upper limit of the total load rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load rating as follows:

Plug-in	Load Rating
626-PA-6001	2 Units
626-PA-6001 With Extra Option Board	3 Units
626-PA-6002	2 Units
626-PA-6003	4 Units
626-PA-6006	2 Units
626-PA-6007	1 Unit
626-PA-6008	2 Units
626-PA-6009	4 Units
626-PA-6011	1 Unit
626-PA-6012	3 Units
626-PA-6014	1 Unit
626-PA-6015	4 Units

When selecting modules for installation in any mainframe, simply verify that the sum of the load ratings of the installed modules does not exceed 20.

13 STANDARD ACCESSORIES

Model No.	Part No.	Quan.	Description
626PA6003-1 (Barrier, Block Connections)	TM110235U	1	Operating Manual
626PA6003-2	TM110235U	1	Operating Manual
	110480-G1	3	A.C. Cables
(Plug-type Connections)			

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14 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Technologies Customer Service Department and obtain an Authorization Number.

   Phone No: 201-287-3680; TWX 710-997-9553

2. Fill out the Repair/Service Order enclosed in this manual and ship it with the equipment to the Customer Service Department.

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI CI) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-110390AU

VOLUME I

OPERATORS'S MANUAL

626-PA-6006

AC NEUTRAL MONITOR

NOTE

Refer to Volume 2 (Service Manual) of TM-110390AU for maintenance data.

1 May 1984

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DRANETZ

DRANETZ TECHNOLOGIES, INC.
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Manual Effectivity

Instruction Manual TM-110390AU provides operating instructions for 626-PA-6006 plug-ins having differential signal inputs. These units have three circuit voltage input connectors or terminal blocks on the rear panel. Units received after October, 1982 will probably be of the differential input type.

If a 626-PA-6006 has a two-circuit voltage input connector or terminal block, TM-110390 applies.

STATEMENT OF WARRANTY

ALL PRODUCTS OF DRANETZ TECHNOLOGIES, INC. ARE WARRANTED TO THE ORIGINAL PURCHASER AGAINST DEFECTIVE MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY. DRANETZ WILL REPAIR OR REPLACE, AT ITS OPTION, ALL DEFECTIVE EQUIPMENT RETURNED, FREIGHT PREPAID, DURING THE WARRANTY PERIOD, WITHOUT CHARGE FOR REPAIR, PROVIDED THERE IS NO EVIDENCE THAT THE EQUIPMENT HAS BEEN MISHANDLED OR ABUSED.

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626-PA-6006 AC NEUTRAL MONITOR

1 INTRODUCTION

This manual provides operating instructions for the 626-PA-6006 AC Neutral Monitor Plug-in, hereinafter referred to as the 6006. The 6006 is designed for installation in the Model 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information presented in TM-106650U.

2 PURPOSE

The 6006 monitors activity on power system neutral lines with respect to earth ground. With thresholds programmed by the user, the 6006 stores, analyzes, classifies and prints out quantitive and qualitative disturbance data. Accompanying the data is a printout of time, derived from a highly accurate crystal controlled 24-hour clock in the mainframe. This single channel unit finds application in all distribution systems having a designated neutral conductor and operating below 600V rms.

The 6006 has a single voltage range that extends from 2V rms to 50V rms. It monitors two types of disturbances: power frequency transients and waveform disturbances. Power frequency transients are divided into three display categories: overvoltage, voltage change, and voltage surge. Since voltage on the neutral line is nominally zero with respect to earth ground, lower voltage limits are not used and voltage sag and undervoltage printouts are not generated. Waveform disturbances, identified as "impulses", are sharp deviations of short duration (compared to line frequency) from the normal waveform. The 6006 measures both peak amplitude of impulses and their polarity. When equipped with an option board the 6006 also measures pulse duration and direction of origin or pulse strength and direction of origin.

The threshold value of each type of disturbance, above which detection and printout occur, is operator programmable. Except for an automatic summary printout at the end of each day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of each day. This feature permits long term unattended operation.

The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in non-volatile memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

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3 EQUIPMENT CHARACTERISTICS

The 6006 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in any of the five slots of the Model 626 Universal Disturbance Analyzer. Technical specifications of the 6006 are listed in Table 1.

Table 1. 626-PA-6006 Technical Specifications

Input	2-wire differential Z = 40 Megohms plus 10 pf (each side in to ground)
Voltage Range	2 - 50V rms 45 - 65 Hz
User-set Upper Limit Voltage	3 - 30V rms
Voltage Change Sensitivity (1V increments)	1 - 9 Volts
Line Voltage Measurement Accuracy	+/-1% of reading, +/-0.2% of F.S. at calibration frequency of 50 or 60 Hz. Additional +/-1% at frequency extremes.
Impulse Ranges (Determined by Impulse Threshold Selection)	25 - 1000V for 25 to 100V thresholds 101 - 2000V for 101 to 200V thresholds 201 - 4000V for 201 to 4000V thresholds
Impulse Duration Range	2 mSec to 1 uSec for amplitude information only.
Impulse Threshold	25 - 4000V in 1 volt increments.
Impulse Amplitude Accuracy	+/-5% of reading +/-1% F.S. for half-sinewave impulses 10 uSec in duration regardless of polarity. Error increases to +/-10% of reading, +/-1/% F.S. at 5 uSec and 50 uSec pulse durations, and is typically -6dB at 2 mSec and 1 uSec pulse durations.

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4 INSTALLATION

To install the 6006 in the mainframe, proceed as follows:

CAUTION: Be sure 626 is turned off and that all power connected to all the plug-in modules is turned off.

a. Position the top and bottom front corners of the plug-in module in the upper and lower tracks at the desired slot position at the rear of the mainframe.

b. Carefully slide the module into the mainframe until it is firmly seated.

c. Tighten the top and bottom captive screws to secure the module to the mainframe.

5 CONNECTING POWER SOURCE TO MODULE

5.1 Connection Procedure

The 6006 is supplied with a barrier type terminal strip under a small cover (626-PA-6006-1) or with a three pin connector (626-PA-6006-2) located at the rear of the module. Proceed as follows:

a. Insert key in FUNCTION key switch on front panel of mainframe and set switch to OFF position.

b. Turn off AC power to the line that is to be monitored.

c. Remove the terminal strip safety cover to expose the connections. Connect the neutral line to the terminal designated "+". Connect the earth ground point used for measurement reference to the terminal designated "-". Connect safety earth ground to terminal marked . When all connections have been made, be sure to replace the terminal block cover, then reapply AC power.

d. If a voltage input connector is installed on the rear panel of the 6006, the AC source to be monitored should be wired to the cable assembly (DEL #110487-G1) supplied with the module. If the supplied cable is not adequate, the mating connector can be obtained from AMP, INC. The part numbers are as follows:

Part Number	Description
1-480700-0	CONNECTOR HOUSING
1-640720-0	STRAIN RELIEF
350690-1	PIN CONTACTS

Attach wired mating connector to the rear panel connector then reapply AC power.

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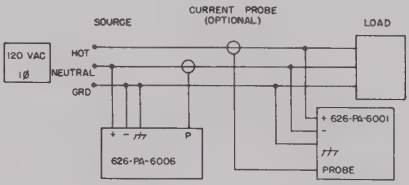
CAUTION

To avoid damaging the equipment, do not apply AC voltage in excess of 600V rms to the 6006.

5.2 Circuit Applications

The 626-PA-6006 is used to monitor Neutral-Ground AC in single or multi-phase systems, usually in combination with the 626-PA-6001 or 626-PA-6003, as illustrated below.



Single Phase AC, with 626-PA-6001

Note

Current probes are included with Option 101 and 102 for 626-PA-6001 Series and 626-PA-6006 Series.

WARNING

Connection should only be performed by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18 (1 mm^2). For branch circuits with higher ampacity, refer to National Electric Code (ANSI CI-1975 Para. 240-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

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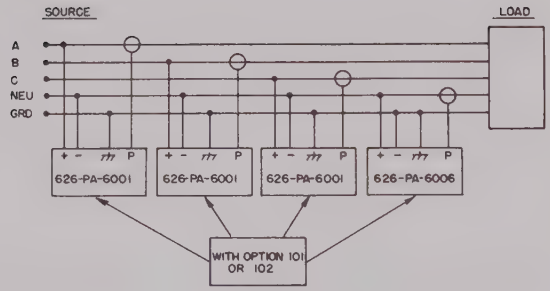
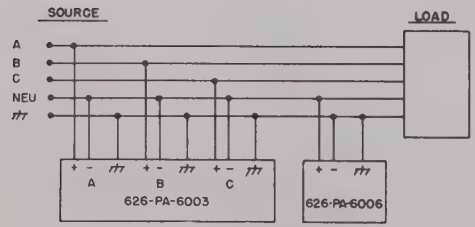


3 Phase Wye, With 626-PA-6001



3 Phase Wye, With 626-PA-6003

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5.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires careful attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidelines should be utilized.

1. To minimize spurious Impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of Impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment, i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade Potential Transformers for monitoring Impulses on high voltage power lines is not recommended. The limited frequency response of most Potential Transformers may result in substantial variation of Impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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6 OPERATING THE 6006

6.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6006 operation are described in Table 2. Figure 1 shows the typical front panel controls associated with a 6006. For a description of controls common to overall Model 626 operation, refer to TM-106650U.

6.2 Programming Procedure

Assume it is desired to program a high limit of 20V, a voltage sensitivity of 2 volts, and an impulse sensitivity of 75V. Sensitivity sets the deviation from the present value above or below which a detected value produces a recorded disturbance.

Impulse ranges are set up automatically in accordance with pulse sensitivity selected. Thus, selection of an impulse sensitivity of 75V automatically produces an impulse range of 25 to 1000V (See Table 1).

Table 2. 6006 Operating Controls

Item	Function
HI LIMIT pushbutton	When depressed, enables numeric keyboard to program high limit voltage.
SENS pushbutton	When depressed, enables numeric keyboard to program voltage sensitivity value.
IMP SENS pushbutton	When depressed, enables numeric keyboard to program impulse voltage sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6006 memory.
DATA pushbutton	When depressed, produces data summary printout. (Functions in operate mode only.)
PROG pushbutton	When depressed, unit prints time and a summary of the program (threshold settings) in each channel in sequence (1-5). (Functions in operate mode only.)
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls nonvolatile factory program for that channel.

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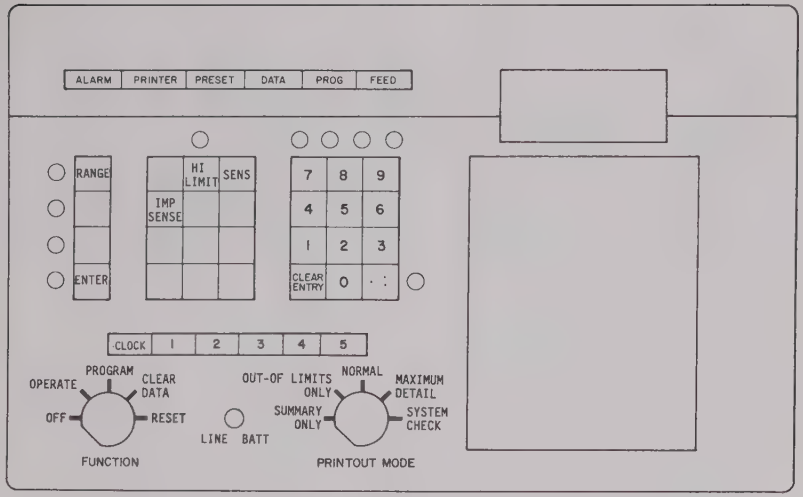

Figure 1. Typical Front Panel of Model 626

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For impulse measurements, the sensitivity corresponds to the absolute threshold, so that for an impulse sensitivity of 75 volts, a disturbance is recorded when impulse amplitude is greater than or equal to 75 volts.

For the example cited, program the 6006 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that the red cueing lamp above the center bank of pushbuttons lights. This indicates that one of the functions in that pushbutton bank is to be selected. Depress the HI LIMIT pushbutton.

d. Note that two yellow lamps above the numeric keyboard now light. Enter 20 using the keyboard. As each digit is entered, one lamp goes out. If an error is made, depress CLEAR ENTRY and correct the entry.

e. When the high limit value has been programmed, the green lamp next to the ENTER pushbutton lights. Depress this pushbutton to enter the value. The high limit entry (V HIGH LIMIT 20V) will now be echoed back on the printout.

f. When the green ENTER indicator goes out, the red indicator above the center bank of pushbuttons lights again. This indicates that another function may be programmed.

g. Depress the SENS pushbutton. Program the voltage sensitivity value (2) as in step d.

h. When the green ENTER indicator lights, depress the ENTER pushbutton. The programmed voltage sensitivity value will be echoed back on the printout.

i. Repeat steps f, g, and h for the impulse sensitivity (0075), using the IMP SENS pushbutton.

j. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

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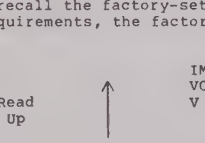
7 SELECTING THE FACTORY/OPTION 103 PRESET PROGRAM

NOTE: Custom Preset Option 103 allows the user to choose his/her own program setup for the PRESET function.

To select the program stored in non-volatile memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. Unless specially modified to customer requirements, the factory-set program for the 6006 is as follows:



8 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6006, it is recorded and displayed as illustrated in the following paragraphs.

8.1 Overvoltage

An overvoltage condition exists when the monitored power line neutral voltage exceeds the user specified upper limit for more than 2.55 seconds. An overvoltage condition is indicated by a printout such as the following:

```
4 HIGH 12:34:56.78
```

where 4 is the channel number and time is given in hours, minutes and seconds (to .01 sec resolution).

When the line voltage recovers to normal, a printout such as the following occurs:

```
4 NORM 12:36:14.56
   35.8 V MAX
```

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

8.2 Voltage Change

A voltage change printout is triggered when the neutral to ground voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user selected integral voltage between one and 9 volts. The following example shows several voltage change printouts:

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Printout	Remarks
2 INC Ø1:Ø2:34.58 15.4V	Voltage increased to 15.4V at time shown
2 DEC Ø1.Ø1:34.56 9.2V	Voltage decreased to 9.2V at time shown

8.3 Voltage Surge

A Voltage Surge is defined as line voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
3 HIGH  12:34:5Ø.49
```

When the line voltage returns to a normal level following a Surge condition, a message such as the following will be printed:

```
3 NORM 12:34:51.59
  35.2 V MAX
SURGE 1.1Ø SEC
```

In this case, the time at which the voltage returned to normal is shown as well as the maximum voltage reached and the surge duration.

8.4 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 3ØØHz to 5ØØKHz range. An impulse type disturbance produces a printout such as the following:

```
2 IMP 1Ø:12:13.45
 +Ø139 V PK
```

This printout indicates that an impulse which deviated from normal neutral line voltage by +139 volts peak was detected on channel 2 at the time shown. The "+" indicates the impulse was positive with respect to the signal return (-) terminal on the rear panel of the 6ØØ6.

9 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise.

The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in Channel 1 and that the limits for Channel 1 were programmed as follows:

```
V HIGH  LIMIT      2ØVrms
V SENSITIVITY       2Vrms
```

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The example printouts are referenced to figure 2 which illustrates an overvoltage disturbance.

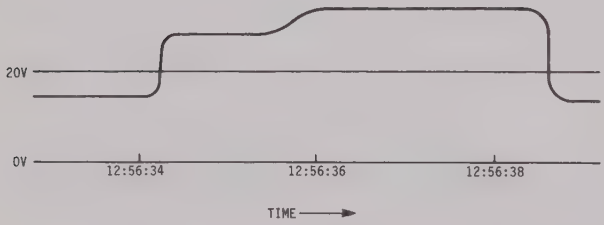

Figure 2. Overvoltage Disturbance (6006)

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

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```
1 NORM 12:56:38.51
  34.1 V MAX
1 HIGH 12:56:34.21
```

Printout of overvoltage (fig. 2) in OUT-OF-LIMITS ONLY mode.

```
1 NORM 12:56:38.51
  34.1 V MAX
1 DEC 12:56:38.50
  25.2 V
1 INC 12:56:35.78
  32.3 V
1 INC 12:56:35.62
  30.3 V
1 inc 12:56:35.40
  28.3 V
1 INC 12:56:34.22
  26.3 V
1 INC 12:56:34.21
  24.2 V
1 HIGH 12:56:34.21
```

(READ UP)

Printout of overvoltage (fig. 2) in NORMAL mode.

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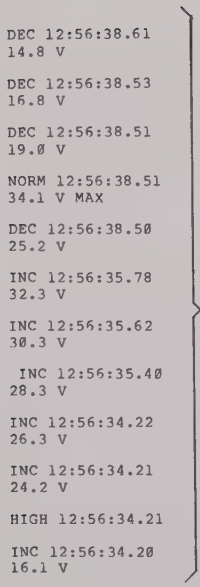

9.1 System Check

When the Printout Mode Switch is set to SYSTEM CHECK, a source of precise signals is applied to the front end circuitry of the 6006. Any inputs that are connected at this time will be automatically disconnected for the system check period. These signals fully verify the functionality of the module. The signals and the allowable tolerance levels are described below.

9.2 System Check Signal Levels

Impulse: +160V pk
Voltage: 30.0 Vrms

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9.3 System Check Signal Tolerances

Impulse: +134 to +186V pk
Voltage: 29.6 to 30.4V rms

10 626 MODULE CAPACITY

The 626 standard mainframe has an upper limit of the total load rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Rating
626-PA-6001	2 Units
626-PA-6001 with extra Option Board	3 Units
626-PA-6002	2 Units
626-PA-6003	4 Units
626-PA-6006	2 Units
626-PA-6006 with extra Option Board	3 Units
626-PA-6007	1 Unit
626-PA-6008	2 Units
626-PA-6009	4 Units
626-PA-6011	1 Unit
626-PA-6012	3 Units
626-PA-6014	1 Unit
626-PA-6015	4 Units

When selecting modules for installation in any mainframe, simply verify that the load rating sum of the installed modules does not exceed 20.

11 STANDARD ACCESSORIES

Model No.	Part No.	Quantity	Description
626-PA-6006-1	TM-110390AU Vol. I	1	Operator's Manual
626-PA-6006-2	TM-110390AU Vol. I	1	Operator's Manual
626-PA-6006-2	110487-G1	1	Input Cable with Tinned Leads

---

12 IMPULSE DURATION/DIRECTION OPTION, OPTION 101 FOR 626-PA-6006 PLUG-IN (NOT COMPATIBLE WITH OPTION 102)

12.1 Introduction

The following paragraphs describe the differences between the 6006 with Option 101 and the standard 6006. The information that follows supersedes that found in previous paragraphs of this manual unless otherwise stated.

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12.2 Purpose

Option 101 has no effect on the neutral to ground voltage measurements of the 6006 described in paragraph 2. It also does not affect the measurement of impulse polarity and peak voltage. Option 101 is designed to provide information on impulse duration. In addition, if the current probe is used, direction of origin will be determined for impulses having a current of 1 Amp or greater at the time of measurement.

12.3 Equipment Characteristics

Technical specifications for Option 101 are listed in Table 3. all specifications for the 6006 listed in Table 1 still apply.

Table 3. 626-PA-6006 Option 101 Technical Specification

IMPULSE DURATION

Range: 1 uSec to 1023 uSec

Accuracy: +/-6% of reading +/-0.3% F.S. for 1/2 sinewave pulses up to 100 uSec duration greater than 100 Vpk. Typically - 10% at 200 uSec, -20% at 400 uSec, -50% at 1000 uSec.

Timing Reference Points: Start at 25V - stop at 30% of Vpk.

Minimum Impulse Voltage: 50 Vpk

IMPULSE DIRECTION OF ORIGIN

Minimum Impulse Current: 1 Amp for 0.1 uSec before and after measurement.

Minimum Impulse Voltage: 50 Vpk

12.4 Installation in Mainframe

The module is installed in the mainframe in the same manner as the standard 6006 described in paragraph 4.

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12.5 Connections to the Module

Connecting the 6006 to the line to be monitored is the same as described in paragraph 5. If impulse direction information is required, the current probe must be connected in the following manner.

a.) Turn off AC power to the line that is to be monitored.

b.) Attach the current probe connector to its mating connector on the rear panel of the 6006.

c.) Install current probe on the line which is connected to the neutral voltage terminal of the corresponding channel, being sure that the LOAD and SOURCE markings on the probe are oriented such that SOURCE is tooward incoming power. Proper connections are shown in figure 3.

d.) Reapply AC power.

Note: Printouts of impulse direction of origin will correlate with the orientation of the LOAD and SOURCE markings on the current probe.

12.6 Operating the 6006 with Option 101

Operation of the 6006 with Option 101 requires no additional programming steps. Programming is the same as described in paragraphs 6 and 7.

12.7 Description of Data Printouts

The only printouts affected by the addition of Option 101 are those for module identification and impulse data.

When the Program Summary key (designated "PROG") is depressed, the module will be identified as a 626-PA-6006R1 as in the following example.

```
            IMPULSE SENS 0100V
Read        VOLTAGE SENS 002V
up    ↑     V HIGH LIMIT 125V
      |      626-PA-600R1
      |        CH 1
            11/17/83   15:20:26
            PROGRAM SUMMARY
```

IMPULSE

A minimum impulse of 50 Vpk is required to obtain duration data. For information on the direction of origin a minimum impulse voltage of 50 Vpk and a minimum impulse current of 1 Amp is required.

If the current probe is not used or if it is used but the impulse current is less than 1 Amp at the time of measurement, the printout will take on the following form:

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```
4 IMP 12:34:56.88
+2057V, 089uS
```

This printout indicates that an impulse which deviated from the normal line voltage for 89 microseconds with a peak voltage of 2057 volts was detected on channel 4 at the time shown. The "+" preceding the impulse voltage indicates that the impulse was positive with respect to the ground terminal on the 6006 rear panel.

IMPULSE WITH DIRECTION

When the current probe is used and the impulse current is greater than 1 Amp at the time of measurement, the printout will take the following form:

```
4 IMP 12:34:57.00
+2057V, LOAD, 089uS
```

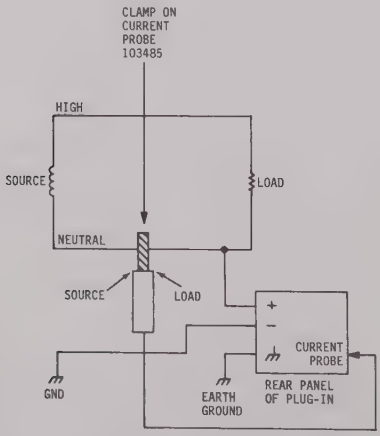

Figure 3. Proper Connections of 626-PA-6006 for Use with Current Probe

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This printout indicates that an impulse originating from the load, of +2057 volts peak and 89 microseconds in duration, occurred at the time shown. If the direction had been from the source, SRCE would be printed in place of load in the example.

Figure 4 illustrates an impulse duration measurement.

12.8 Printout Modes

Printout modes and calibration signals remain the same as in the standard 6006 described in paragraph 9.

13 IMPULSE STRENGTH/DIRECTION OPTION, OPTION 102 FOR 626-PA-6006 PLUG-IN (NOT COMPATIBLE WITH OPTION 101)

The following paragraphs describe the differences between the 6006 with Option 102 and the standard 6006. The information that follows supersedes that found in previous paragraphs of this manual unless otherwise stated.

13.2 Purpose

Option 102 has no effect on the neutral-to-ground voltage measurements of the 6006 described in paragraph 2. It also does not affect the measurement of impulse polarity and peak voltage. Option 102 is designed to provide information on impulse strength. Also, if the current probe is used, direction of origin will be determined for impulses having a current of 1 Amp or greater at the time of measurement.

13.3 Equipment Characteristics

Technical specifications for Option 102 are listed in Table 4. All specifications for the 6006, listed in Table 1, still apply.

Table 4. 626-PA-6006 Option 102 Technical Specifications

IMPULSE STRENGTH

Range: 0.0002 to 0.2046 V-Sec

Accuracy: ±10% of reading, ±1% of F.S. for 1/2 sinewave pulses up to 100 uSec duration greater than 100 Vpk. Typically -20% at 200 uSec, -50% at 500 uSec.

Timing Reference Points: Start at 25V - stop at 30% of Vpk.

Minimum Impulse Voltage: 50 Vpk

IMPULSE DIRECTION OF ORIGIN

Minimum Impulse Current: 1 Amp for 0.1 uSec before and after measurement.

Minimum Impulse Voltage: 50 Vpk

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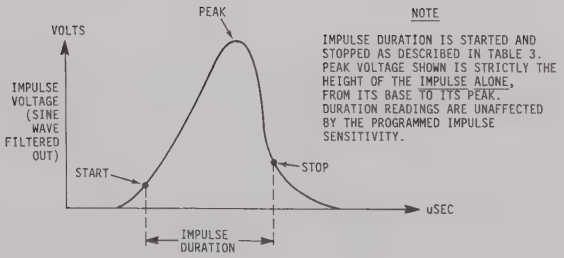
PEAK
VOLTS
IMPULSE VOLTAGE (SINE WAVE FILTERED OUT)
START
STOP
uSEC
IMPULSE DURATION
NOTE
IMPULSE DURATION IS STARTED AND STOPPED AS DESCRIBED IN TABLE 3. PEAK VOLTAGE SHOWN IS STRICTLY THE HEIGHT OF THE IMPULSE ALONE, FROM ITS BASE TO ITS PEAK. DURATION READINGS ARE UNAFFECTED BY THE PROGRAMMED IMPULSE SENSITIVITY.

Figure 4. Impulse Duration Measurement

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13.4 Installation in Mainframe

The module is installed in the mainframe in the same manner as the standard 6006 described in paragraph 4.

13.5 Connections to the Module

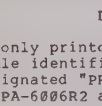
Connecting the 6006 to the line to be monitored is the same as described in paragraph 5. If impulse direction information is required, the current probe must be connected as described in paragraph 12.5.

13.6 Operating the 6006 with Option 102

Operation of the 6006 with Option 102 requires no additional programming steps. Programming is the same as described in paragraphs 6 and 7.

13.7 Description of Data Printouts

The only printouts affected by the addition of Option 102 are those for module identification and impulse data. When the Program Summary key (designated "PROG") is depressed, the module will be identified as a 626-PA-6006R2 as in the following example.



IMPULSE

A minimum impulse voltage of 50 Vpk is required to obtain area data. For information on the direction of origin, a minimum impulse voltage of 50 Vpk and a minimum impulse current of 1 Amp is required.

If the current probe is not used, or if it is used but the impulse current is less than 1 Amp at the time of measurement, the printout will take the following form:

```
4 IMP 12:34:56.88
0.0156 V-SEC
.+2057V
```

This printout indicates that an impulse which deviated from the normal line voltage with a strength of 0.0156V-Sec and a peak voltage of 2057 volts was detected on channel 4 at the time shown. The "+" preceding the impulse voltage indicates that the impulse was positive with respect to the ground terminal on the 6006 rear panel.

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IMPULSE WITH DIRECTION

When the current probe is used and the impulse current is greater than 1 Amp at the time of measurement, the printout will take the form of the following:

```
4 IMP 12:34:57.ØØ
Ø.Ø156 V-SEC
+2Ø57V, LOAD
```

This printout indicates that an impulse originating from the load, of +2Ø57 volts peak and a strength of Ø.Ø156V-Sec, occurred at the time shown. If the direction had been from the source, SRCE would be printed in place of LOAD in the example.

Figure 5 illustrates an impulse strength (area) measurement.

13.8 Printout Modes

Printout modes and calibration signals remain the same as in the standard 6ØØ6 described in paragraph 9.

14 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Technologies Service Department and obtain an Authorization Number.

   Phone No: 2Ø1-287-3680; TWX 71Ø-997-9553

2. Fill out the Repair/Service Order enclosed in this manual and ship it with the equipment to the Customer Service Department.

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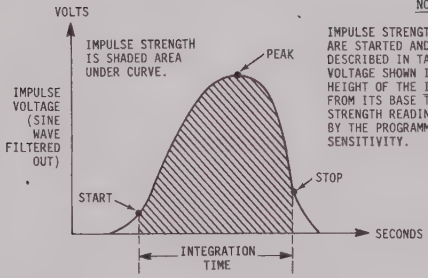
VOLTS
IMPULSE STRENGTH IS SHADED AREA UNDER CURVE.
PEAK
IMPULSE VOLTAGE (SINE WAVE FILTERED OUT)
START
STOP
SECONDS
INTEGRATION TIME
NOTE
IMPULSE STRENGTH MEASUREMENTS ARE STARTED AND STOPPED AS DESCRIBED IN TABLE 4. PEAK VOLTAGE SHOWN IS STRICTLY THE HEIGHT OF THE IMPULSE ALONE, FROM ITS BASE TO ITS PEAK. STRENGTH READINGS ARE UNAFFECTED BY THE PROGRAMMED IMPULSE SENSITIVITY.

Figure 5. Impulse Strength Measurement

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-110280-1U

VOLUME 1

OPERATOR'S MANUAL

626-PA-6007

EVENT MONITOR

Note Refer to Volume 2 (Service Manual) of TM-110280-1U for maintenance data.

1 May 1984
(Revised 1 July 1984)

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DRANETZ

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626-PA-6007 EVENT MONITOR

1 INTRODUCTION

This manual provides operating instructions for the 626-PA-6007 Event Monitor Plug-in, hereinafter referred to as the 6007. The 6007 is designed for installation in the Model 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information presented in TM-106650U.

2 PURPOSE

The 6007 monitors the state of up to 8 inputs. It senses, identifies and records, in a convenient alphanumeric printout, rapid state changes of such inputs as electromechanical or solid-state relays with a response time of 1 millisecond. The 6007 provides highly accurate and reliable time sequence information, even from extremely noisy sources.

3 EQUIPMENT CHARACTERISTICS

The 6007 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in any of the five slots of the Model 626 Universal Disturbance Analyzer. Technical specifications of the 6007 are listed in Table 1.

Table 1. 626-PA-6007 Technical Specifications

No. of Channels	8
Input	2 wire differential Z_{in} = 1 Megohm min (each side to ground)
Normal differential input for "high" input state	5-25 VDC
Common mode voltage	±200V DC max with respect to earth ground
Min. Validation Time	5 mSec, 10 mSec, 20 mSec, or 320 mSec (programmable)

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4 INSTALLATION

To install the 6007 in the mainframe, proceed as follows:

CAUTION: Be sure that the 626 is turned off and that all power connected to all the plug-in modules is turned off.

a. Position the top and bottom front corners of the plug-in module in the upper and lower tracks at the desired slot position at the rear of the mainframe.

b. Carefully slide the module into the mainframe until it is firmly seated.

c. Tighten the top and bottom captive screws to secure the module to the mainframe.

5 CONNECTING INPUT CHANNELS

5.1 Connection Procedure

The 6007 is equipped with eight 3-pin connectors installed at the rear of the module. The input leads must be wired to the mating connectors supplied with the module, observing the polarity as marked on the rear panel. Attach each wired mating connector to the corresponding (1-8) rear pannel connector.

CAUTION: To avoid damaging the equipment, do not apply DC voltages in excess of 200V to the 6007.

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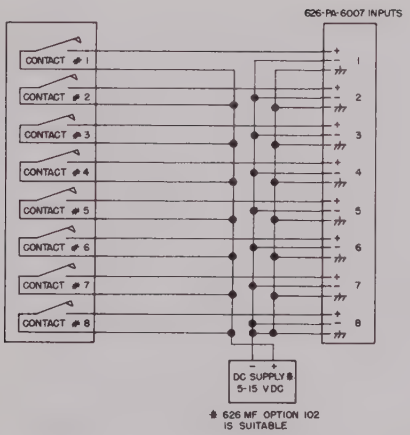
5.2 Circuit Applications



Connection to Relay Contacts (Separate Contact Supply Required)

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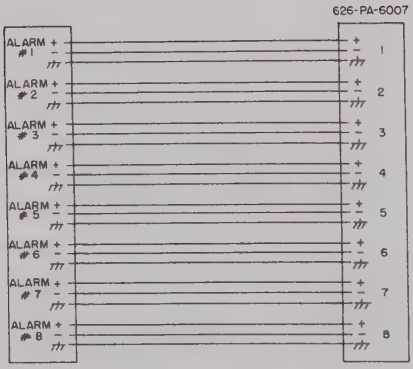

Connection to Backplane Alarm Signals
(No Separate Contact Supply Required)

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6 OPERATING THE 6007

6.1 Operational Description

The 6007 records and prints out any change of state of any of its eight inputs. Inputs can be programmed to be "normally closed" (or "high" or "on") or "normally open" (or "low or "off"), in accordance with the application. Minimum validation time is also program selectable to 5 mSec, 10 mSec, 20 mSec or 320 mSec. Both input state and validation parameters are stored in CMOS Random Access Memory so they are maintained when the 626 is turned off.

When any input changes state, the change data and alarm/normal status of all the inputs are stored. Depending on the printout mode selected, the channel number, input number, alarm/normal status and time of change are printed out. The number of transitions to the alarm state is also stored and printed out during the data summary (along with present state). If a memory overflow occurs, only the transition count is updated. The transition count is stored in the short term accumulator and is printed out when the overflow condition is cleared.

There are three input terminals: +, -, and GND. Since the maximum common mode voltage is +200V DC, maximum inputs from ground are as follows: positive input = 200V DC, negative input = 197V DC; or positive input = -197V DC, negative input = -200V DC

The inputs actually change state as follows:

ON = 2.30V DC max
OFF = 1.80V DC min
Hysteresis = 0.10V DC min

6.2 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with the 6007 operation are described in Table 2. Figure 1 shows the typical front panel controls associated with the 6007. For a description of controls common to overall Model 626 operation, refer to Volume 1 of TM-106650U.

Table 2. 6007 Operating Controls

Item	Function
F SENS pushbutton	Used in interactive program to change minimum validation time.
SENS pushbutton	Used in interactive program to change polarity of input state(s).
DATA pushbutton	When depressed, produces data summary printout.

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6.3 Programming Procedure

Assume it is desired to program the minimum validation time of the eight input channels of a 6007 to 10 mSec and the polarities (or states) of the eight inputs as follows:

Input Channel	1	2	3	4	5	6	7	8
Polarity	1	1	0	0	0	0	0	1

where 1 represents N/C or on and 0 is N/O or off

a. Set the FUNCTION switch to PROGRAM and depress the pushbutton (1-5) that corresponds to the slot position of the 6007 plug-in to be programmed. As shown in the sample printout of figure 2, note that a program summary is printed, followed by prompt message #1. In the summary, minimum validation time is shown as 5 mSec and the polarity of each channel is shown as 0. Prompt message #1 permits the operator to change any or all polarities or the minimum validation time.

b. To reprogram polarity, respond to prompt message #1 by pressing the SENS pushbutton. This causes prompt message #2 to be generated. Now press 1 1 0 0 0 0 0 1 to update the polarities of the eight inputs.

c. Note that a new summary is now generated, followed by prompt message #1. Polarity is updated, but minimum validation time has not changed.

d. To reprogram minimum validation time, press F SENS. Note that prompt message #3 is printed. To change the minimum time to 10 mSec, press "2". At this time, another summary is printed, indicating that both polarity and minimum time have been corrected. Another prompt message #1 is also generated, enabling further changes to be made, if so desired.

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Figure 1. Typical Front Panel with 6007 Installed in Mainframe.

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```
TO CHANGE POLARITY
PRESS: 'SENS'
TO CHANGE MIN TIME
PRESS: 'F SENS'

P 1 1 0 0 0 0 0 1
# 1 2 3 4 5 6 7 8

MIN TIME=010 MSEC

     626-PA-6007
4 FOR 320 MSEC
3 FOR 20 MSEC
2 FOR 10 MSEC
1 FOR 5 MSEC
PRESS

TO CHANGE POLARITY
PRESS: 'SENS'
TO CHANGE MIN TIME
PRESS: 'F SENS'

P 1 1 0 0 0 0 0 1
# 1 2 3 4 5 6 7 8

MIN TIME=005 MSEC

    626-PA-6007
0 FOR N/O OR OFF
1 FOR N/C OR ON
ENTER 8 DIGITS

TO CHANGE POLARITY
PRESS: 'SENS'
TO CHANGE MIN TIME
PRESS: 'F SENS'

P 0 0 0 0 0 0 0 0
# 1 2 3 4 5 6 7 8

MIN TIME=005 MSEC

    626-PA-6007
       CH 2
PROGRAM SUMMARY

 PROGRAM MODE
```

Prompt message #1

Program summary #3

Prompt message #3

(Read Up)

Prompt message #1

Program summary #2

Prompt message #2

Prompt message #1

Program summary #1

Figure 2. Sample Programming Printout

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7 SELECTING THE FACTORY/OPTION 101 PRESET PROGRAM

NOTE: Custon Preset Option 101 allows the user to choose his/her own program for the PRESET function.

To select the program stored in non-volatile memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. Unless specially modified to customer requirements, the factory-set program for the 6007 is as follows:

```
TO CHANGE POLARITY
PRESS:  'SENS'
TO CHANGE MIN TIME
PRESS:  'F SENS'

P 0 0 0 0 0 0 0 0
# 1 2 3 4 5 6 7 8

MIN TIME=005 MSEC

   626-PA-6007

TO CHANGE POLARITY
PRESS: 'SENS'
TO CHANGE MIN TIME
PRESS: 'F SENS'

P 1 0 1 1 0 1 1 0
# 1 2 3 4 5 6 7 8

MIN TIME=020 MSEC

   626-PA-6007
      CH 4
PROGRAM SUMMARY

 PROGRAM MODE
```

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8 DESCRIPTION OF DATA PRINTOUTS

With the FUNCTION switch set to OPERATE, a change of state detected in any of the eight inputs to the 6007 produces a printout. A sample appears below:

```
2  #4  N  19:42:59.47
2  #4  A  19:42:59.42          ↑  Read Up
2  #3  N  19:42:53.28
2  #3  A  19:42:49.56
```

Each line defines the channel number (2, in this case), the input number (3 or 4), the state of that input and the time of the change.

If the change state activity increases to such a rate that a memory overflow condition occurs, the 6007 initiates a summary mode printout when the overflow interval ends. This printout indicates, for the example below, that 44 alarm "hits" were detected in input No. 8 during the overflow period. Note that for this summary, only those inputs that change are printed.

```
#8   0044   ALARM   HIT
                                  ↑  Read Up
     626-PA-6007
        CH 2

     SUMMARY MODE
```

If the DATA pushbutton is depressed, a data summary is printed. For each input channel, the data summary indicates the number of transitions to the alarm state as well as the present state.

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```
#8   A   0015   ALR   HIT
#7   N   0003   ALR   HIT
#6   N   0000   ALR   HIT
#5   N   0003   ALR   HIT
#4   N   0007   ALR   HIT
#3   N   0002   ALR   HIT
#2   A   0004   ALR   HIT
#1   A   0006   ALR   HIT

        626-PA-6007
           CH2

    10/17/83   19:40:07
       DATA SUMMARY
```

Read Up

When the PRINTOUT MODE switch is set to SYSTEM CHECK, board status is checked and a SYSTEM CHECK printout is produced. If the 6007 module is determined to be good, a SYSTEM CHECK printout such as the following is produced.

```
**************************

        BD OPERATIONAL
          626-PA-6007
            CH 1
    10/17/83    19:42:08

****SYSTEM CHECK ****
```

(Read Up)

If an abnormal condition is detected, the line BD OPERATIONAL may be replaced by one of the following:

```
INTERRUPT ERROR
INPUT ERROR
DATA ERROR
```

SYSTEM CHECK cannot be activated if the 6007 is programmed to 320 mSec minimum validation time. Any error causes the board to be turned off until the error is corrected or unit is reset. The DATA SUMMARY will display "BD OFF" as well as the usual message. Note that the SYSTEM CHECK printout starts and ends with asterisks.

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To obtain a program summary of the plug-ins in the Model 626, set the FUNCTION switch to OPERATE and depress the PROG pushbutton. The following program summary was obtained with a single 6007 module installed in slot position 2.

```
P  1  1  0  0  0  0  0  1
#  1  2  3  4  5  6  7  8

MIN  TIME=010 MSEC

   626-PA-6007                          ↑  (Read Up)
      CH 2                              |

10/17/83   19:40:40

 PROGRAM SUMMARY
```

9 ASSEMBLING CABLES FOR 626-PA-6007

To attach the wires to the pins provided in the accessory bag for use with the 626-PA-6007, AMP tool #90325-1 is recommended. If this tool is not available, the following procedure may be used instead.

1) Take the three conductor twisted pair of red, green and black 24 AWG wires and untwist the 2 inches at one end.

2) Strip the insulation back 1/2" ±1/16" and tin the wires.

3) Insert the wire into the pin until 1/8" of insulation is touching the pin (so edge of insulation is even with the first (outer) set of tabs.) Bend these tabs tightly over the insulated wire, one at a time, with a needle-nose pliers.

4) Bend the inner tabs tightly over the stripped wire, one at a time, with a needle-nose pliers.

5) Apply a soldering iron to the inner tab. After heating for several seconds, apply a small amount of rosin core solder to the point of contact. Let flow for several seconds and remove soldering iron. Do not heat too long or the insulation may melt.

6) Repeat for the remaining 2 wires in the group.

7) When the pin has cooled, insert the pins into the connectors provided as follows, until a click is felt.

a. Red wire into hole marked #1.
b. Black wire into hole marked #2.
c. Green wire into hole marked #3.

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10 626 MODULE CAPACITY

The 626 standard mainframe has an upper limit of the total load rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-In	Load Rating
626-PA-6001	2 Units
626-PA-6001 With Extra Option Board	3 Units
626-PA-6002	2 Units
626-PA-6003	4 Units
626-PA-6006	2 Units
626-PA-6007	1 Unit
626-PA-6008	2 Units
626-PA-6009	4 Units
626-PA-6011	1 Unit
626-PA-6012	3 Units
626-PA-6014	1 Unit
626-PA-6015	4 Units

When selecting modules for installation in any mainframe, simply verify that the sum of the load ratings of the installed modules does not exceed 20.

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11 STANDARD ACCESSORIES

Part No	Quantity	Description
TM110280-1U	1	Operator's Manual
AMP 1-350352-9	8	Pin Housing Connectors
AMP 640545-1	24	Pin Contacts
110289	1	Instruction Decal

12 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Technologies Customer Service Department and obtain an Authorization Number.

   Phone: 201-287-3680; TWX: 710-997-9553

2. Fill out the Repair/Service Order enclosed in this manual and ship it with the equipment to the Customer Service Department.

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-111025U

VOLUME I

OPERATOR'S MANUAL

626-PA-6008

TEMPERATURE AND HUMIDITY MONITOR

Note

Refer to Volume 2 (Service Manual) of TM-111025U for maintenance data.

1 May 1984
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626-PA-6008 TEMPERATURE AND HUMIDITY MONITOR

1 INTRODUCTION

This manual provides operating instructions for the 626-PA-6008 Temperature and Humidity Monitor Plug-in, hereinafter referred to as the 6008. The 6008 is designed for installation in the Model 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in TM-106650U

2 PURPOSE

The 6008 is a 2-channel module which monitors temperature and humidity. One channel monitors temperature from 0 to 100 degrees C; the other channel monitors relative humidity from 0 to 100% relative humidity (RH). With thresholds programmed by the user, the 6008 stores, analyzes, classifies and prints out quantitative and qualitative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The 6008 monitors changes in any of these parameters, based on user programmable sensitivities and high and low limits. Each input takes eight readings over a 20-second period and then averages the readings to determine if a threshold or limit crossing has occurred. The sensitivity value of each type of disturbance, above which detection and printout occurs, is operator programmable. The time spent out of the user-programmable limits is also accumulated on a daily basis and made available from the data summary printouts. Except for an automatic summary printout at the end of each day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance summary printout occurs only at the end of each day. This feature permits long term unattended operation.

The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

3 EQUIPMENT CHARACTERISTICS

The 6008 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in any one of the five slots of the Model 626 Universal Disturbance Analyzer. Technical specifications of the 6008 are listed in Table 1.

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Table 1

626-PA-6008 Specifications

Input Temperature	
Range:	1 to 100 deg C
Accuracy:	+/- 1 deg C
Cable Length:	100 ft max (30.5 m)
Cable Temperature:	105 deg C max
Input Relative Humidity	
Range:	0 to 80%* RH for $0 \leq T \leq 70^{\circ}C$
Accuracy:	+/- 3% RH +/- .05 $(t-20)$ +/- .02 reading
Cable Length:	100 ft max (30.5 m)
Cable Temperature:	105 deg C max
Programmable Parameters	
Temperature	
Low limit	0 deg C min
High limit	102 deg C max
Sensitivity	1 deg C min max
Preset to	LO = 20, HI = 30, SENS = 2
Humidity	
Low limit	0% RH
High limit	102% RH
Sensitivity	1% RH min
Preset to	LO = 40, HI = 60, SENS = 5

* Note additional drift above 80% RH. (See figure 1.)

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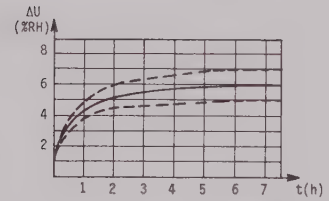
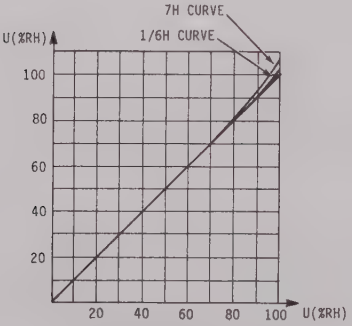


ADDITIONAL ERROR FOR EXTENDED
TIME SPENT > 95% RH



DRIFT DUE TO EXTENDED TIME
AT HIGH HUMIDITY

NOTE: UNIT SHOULD BE CALIBRATED AFTER SEVERAL HOURS AT HIGH HUMIDITY IF IS INTENDED TO BE USED IN THIS MANNER.

Figure 1. Effect of High Humidity on Drift

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4 INSTALLATION

To install the 6008 in the mainframe, proceed as follows:

CAUTION: Be sure 626 is turned off and that all power connected to all the plug-in modules is turned off.

a. Position the top and bottom front corners of the plug-in module in the upper and lower tracks at the desired slot position at the rear of the mainframe.

b. Carefully slide the module into the mainframe until it is firmly seated.

c. Tighten the top and bottom captive screws to secure the module to the mainframe.

5 CONNECTING THE SENSOR PROBES TO THE MODULE

CAUTION

To avoid damaging the equipment, do not connect or disconnect the probes while the 626 is turned on.

5.1 Connection Procedure

The 6008 is supplied with two connectors on the rear panel. The 6-contact connector is used for the Humidity Probe (DTI P/N 111067) and the 3-contact connector is used for the Temperature Probe (DTI P/N 111059). Proceed as follows:

a. Insert key in FUNCTION key switch on the front panel of the mainframe and set switch to OFF position.

b. Attach the connectors on the two probes to the appropriate rear panel connectors.

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5.2 Applications

The Humidity Probe can be taped in place, held with strips of Velcro, or hung using tie wraps with eyelets. The Temperature Probe can be hung with its metal clip, taped in place, or fastened using the included tie wraps.

Computer Specifications:

Computer manufacturers are more commonly paying attention to temperature and humidity within the computer room. One major manufacturer makes the following recommendations:

Temperature:	Minimum:	18°C (65°F)
	Maximum:	24°C (75°F)
Humidity:	Minimum:	40% R.H.
	Maximum:	60% R.H.

Specifications from individual companies should be available on request, from their Service departments. The 626-PA-6008 may then be programmed to match.

6 OPERATING THE 6008

6.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with the 6008 are described in Table 2. Figure 2 shows the typical front panel controls associated with a 6008. For a description of controls common to overall Model 626 operation, refer to Volume 1 of TM-106650U

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Figure 2. Typical Front Panel with 6008 Installed in Mainframe

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Table 2. 6008 Operating Controls

Item	Function
INPUT pushbutton	Used to select temperature or humidity programming
LO LIMIT pushbutton	When depressed, enables the numeric keyboard to program low limit for temperature or humidity.
HI LIMIT pushbutton	When depressed, enables the numeric keyboard to program high limit for either input.
SENS pushbutton	When depressed, enables numeric keyboard to program sensitivity for either input.
NUMERIC pushbuttons	When single lamp lights, user is cued to press a "0" or "1" for temperature or humidity input, respectively. Also used to enter numerical values for other functions.
ENTER pushbutton	When depressed, transfers numeric keyboard values into 6008 memory for processing.
DATA pushbutton	When depressed, produces data summary printout.
PROG pushbutton	When depressed, produces a program summary printout.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that input.

6.2 Programming Procedure

Assume it is desired to program a temperature high limit of 35 deg C, a low limit of 15 deg C, and a sensitivity of 3 deg C. In addition, the humidity input is to be programmed for a high limit of 75%, a low limit of 35% and a sensitivity of 10%.

For the example cited, program the 6008 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

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c. Note that the red LED next to the INPUT pushbutton is lit. Press the INPUT pushbutton. Note that the following prompt message is printed and a single yellow LED is lit.

```
1 FOR HUMIDITY
Ø FOR TEMPERATURE          ↑   (read up)
ENTER:
```

d. Depress a "Ø" or "1", depending on which input you wish to change. Note that the green LED adjacent to the ENTER key is lit, waiting for the ENTER key to be depressed.

(assume a "Ø" was depressed for the following example)

e. When the ENTER indicator goes out, an indicator above the center bank of pushbuttons lights. This indicates that one of the functions (HI LIMIT, LO LIMIT, SENSITIVITY) may now be programmed. At this time the PRESET button could also be depressed to change all of the parameters for temperature and humidity to the factory-preset values.

f. Depress the HI LIMIT pushbutton.

g. Note that three yellow LEDS above the numeric keyboard are now lit. Enter Ø35, using the keyboard. If an error is made, depress CLEAR ENTRY and then the correct entry. Note that the leading zero for numbers less than 1ØØ must be entered.

h. When the value is entered, the lamp next to the ENTER pushbutton lights. Depress this pushbutton to enter the value.

i. Repeat steps c through h for the low limit value (Ø15), using the LO LIMIT pushbutton.

j. Repeat steps c through h for the sensitivity value (Ø3), using the SENS pushbutton. Note that only two yellow LEDs light in step g.

k. The same sequence is used to change the humidity input, except a "1" is entered instead of a "Ø" in step c.

l. The completed program printout should take the following form:

```
HIGH LIMIT Ø75
LOW LIMIT Ø35
SENS Ø1Ø
   HUMIDITY          (read up)

HIGH LIMIT Ø35              ↑
LOW LIMIT Ø15               |
SENS ØØ3                    |
   TEMPERATURE              |

  626-PA-6ØØ8               |
      CH2                   |
PROGRAM SUMMARY             |
```

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NOTE

The instrument is designed to detect an invalid entry. For example, if the high limit value is selected as 30 deg C, and the user selects a low limit value of 35 deg C, the following printout will appear.

HI LIMIT Ø30
LO LIMIT Ø29

m. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he (she) may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program currently in effect may be obtained by simply depressing the PROG pushbutton.

7 SELECTING THE FACTORY/OPTION 101 PRESET PROGRAM

NOTE: Custom Preset Option 101 allows the user to choose his/her own program for the PRESET function.

To select the program stored in non-volatile memory, set the FUNCTION switch to PROGRAM and depress the channel member desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. Unless specially modified to customer requirements, the factory-set program for the 6008 is as follows:

HIGH LIMIT Ø75
LOW LIMIT Ø25
SENS Ø05
HUMIDITY

HIGH LIMIT Ø30
LOW LIMIT Ø20
SENS Ø02
TEMPERATURE

626-PA-6008 (Read Up)

HIGH LIMIT Ø50
LOW LIMIT Ø15
SENS Ø07
HUMIDITY

HIGH LIMIT Ø35
LOW LIMIT Ø15
SENS Ø04
TEMPERATURE

626-PA-6008
CH 5
PROGRAM SUMMARY

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8 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6008, it is recorded and displayed in characteristic manner.

8.1 Over Limit for Temperature or Humidity

An over limit condition exists when the monitored averaged value of temperature or humidity exceeds the user-specified upper limit for the respective input. An over limit condition is indicated by a printout such as the following:

```
4T HI 10:47:12.98
        or
4H HI 10:47:09.76
```

where the 4 is the channel number, the T is for temperature, the H is for humidity, and the time is given in hours, minutes and seconds (to 0.01 sec resolution).

When the temperature or humidity recovers to normal, a printout such as the following occurs:

```
4T NOR 10:55:13.77
   073.3 DEG C MAX
        or
4H NOR 11:12:34.21
   065.5 % RH MAX
```

indicating when the normal temperature or humidity was restored and the value of the highest temperature or humidity reached during the over limit interval.

8.2 Under Limit for Temperature or Humidity

An under limit condition exists when the monitored temperature or humidity goes below the user-specified lower limit. An under limit condition is indicated by a printout such as the following:

```
4T LO 13:33:23.78
        or
4H LO 12:59:00.01
```

When the temperature or humidity returns to normal, a message such as the following is printed:

```
4T NOR 13:44:56.98
   003.1 DEG C MIN
        or
4H NOR 12:59:58.99
   024.2 % RH MIN
```

indicating when the normal condition was restored and the value of the lowest temperature or humidity reached during the under limit interval.

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8.3 Temperature or Humidity Change

A temperature or humidity printout is triggered when the temperature or humidity changes more than a preselected amount from the last printed value. The change sensitivity is a user selected value, selected independently for temperature or humidity. The following example shows several temperature and humidity changes.

Printout	Remarks
2T DEC Ø1:22:34.76	Temperature decreased to 13.3 deg C
Ø13.3 DEG C	at the time shown
2H INC Ø1:23:55.32	Humidity increased to 87.3 % RH
Ø87.3 % RH	at the time shown

The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in Channel 2 and that the limits for Channel 2 were programmed as follows:

T LOW LIMIT	2Ø DEG C
T HIGH LIMIT	3Ø DEG C
T SENSIVITY	Ø2 DEG C
H LOW LIMIT	25 % RH
H HIGH LIMIT	75 % RH
H SENSITIVITY	Ø5 % RH

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button. The following is an example of a DATA summary:

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```
TIME= 0000.6 MIN    time spent HI for humidity
MAX  102.1 % RH     max humidity value for day
HIGH  001 HT        number of high excursions
TIME= 0001.0 MIN    time spent LO for humidity
MIN  000.1 % RH     min. humidity value for day
LOW   002 HT        number of low excursions
PRES=070.4 % RH     present humidity level
   HUMIDITY
TIME= 0002.2 MIN    (same as above, except
MAX  032.8 DEG C       for temperature)
HIGH  003 HT
TIME= 0032.4 MIN
MIN  018.5 DEG C
LOW   020 HT
PRES=031.4 DEG C
  TEMPERATURE

  626-PA-6008          (Read up)
      CH2

10/17/83   10:48:15
   DATA SUMMARY

2T NOR 12:56.38.51    Printout of over limit
   078.2 DEG C        in OUT-OF-LIMITS ONLY mode

2T HI 12:56:34.52

2H NOR 03:55:45.98
   013.5 % RH

2H INC 03:53:34.89
   024.8 % RH

2H INC 03:50:57.67    Printout of under limit
   019.3 % RH         in NORMAL mode.

2H DEC 03:40.11.23
   013.5 % RH

2H DEC 03:39:45.33
   021.1 % RH

2H LO 03:39:45.33          (Read Up)
```

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9 SYSTEM CHECK

When the PRINTOUT mode switch is set to SYSTEM CHECK, the precision reference signals are applied to the measuring circuitry. The probe inputs are disconnected during this time. These signals verify the functionality of the module, but not the actual sensors. The sensors can be checked by use of a calibrated standard (for temperature, a precise temperature chamber; and for humidity, a low and high end calibration salt bath). The allowable tolerance levels are described below, along with a sample printout:

```
**********************

     H=Ø1Ø.2            +/-Ø.3
     T=Ø91.9            +/-Ø.6

   625-PA-6ØØ8
     CH2                          (Read Up)


1Ø/14/83   12:34:56
***SYSTEM CHECK***

**********************
```

1Ø SHORT TERM ACCUMULATOR

If disturbances should take place at a rate faster than the 626 mainframe can process and print them out (and the internal event stack memory should overflow), then subsequent events until the overflow condition is cleared, are stored in summary form in the Short Term Accumulators. These values are cleared out after the printout of the Short Term Accumulators is complete. The format is identical to the Data Summary except there are no accumulated time values, and the values are printed out only when a HI or LO limit was crossed to expedite the printing.

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11 626 MODULE CAPACITY

The 626 standard mainframe has an upper limit of the total load rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Rating
626-PA-6001	2 Units
626-PA-6001 With Extra Option Board	3 Units
626-PA-6002	2 Units
626-PA-6003	4 Units
626-PA-6006	2 Units
626-PA-6007	1 Unit
626-PA-6008	2 Units
626-PA-6009	4 Units
626-PA-6011	1 Unit
626-PA-6012	3 Units
626-PA-6014	1 Unit
626-PA-6015	4 Units

When selecting modules for installation in any mainframe, simply verify that the sum of the load ratings of the installed modules does not exceed 20.

12 STANDARD ACCESSORIES

Model No.	Part No.	Quan.	Description
626-PA-6008	TM111025	1	Operating Manual
	111061	1	Humidity Probe
	111059	1	Temperature Probe

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13 OPTIONAL ACCESSORIES

Part No.	Description
111055	Extension cable for use with Humidity Probe. 90 foot (27 meter) cable extends total lead length to 100 feet (30 meters). Use only one extension cable per probe.
111056-G2	Extension cable for use with Temperature Probe. 90 foot (27 meter) cable extends total lead length to 100 feet (30 meters). Use only one extension cable per probe.
111058	Extension cable set combines 1 each 111055 and 111056-G2.

14 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Technologies Customer Service Department and obtain an Authorizartion Number:

   Phone: 201-287-3680; TWX: 710-997-9553

2. Fill out the Repair/Service Order enclosed in this manual and ship it with the equipment to the Customer Service Department.

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-110280-3U

VOLUME I

OPERATOR'S MANUAL

626-PA-6011

EVENT TIME ACCUMULATOR

Note: Refer to Volume 2 (Service Manual) of TM-110280-3U for maintenance data.

1 May 1984
(Revised 1 July 1984)

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626-PA-6011 EVENT TIME ACCUMULATOR

1 INTRODUCTION

This section provides operating instructions for the 626-PA-6011 Event Time Accumulator Plug-in, hereinafter referred to as the 6011. The 6011 is designed for installation in the Model 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information presented in TM-106650U.

2 PURPOSE

The 6011 monitors the state of up to 8 inputs. It senses, identifies and records, in a convenient alphanumeric printout, rapid state changes of such inputs as electro-mechanical or solid-state relays with a response time of 1 millisecond. The time between change of states is also recorded, and the total time spent in a given state is also accumulated. The 6011 provides highly accurate and reliable time sequence information, even from extremely noisy sources.

3 EQUIPMENT CHARACTERISTICS

The 6011 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in any of the five slots of the Model 626. Technical specifications of the 6011 appear in Table 1.

Table 1. 626-PA-6011 Technical Specifications

No. of Inputs	8
Input	
Impedance	2 wire differential 1 Megohm to ground (each side)
"On" State	2.3Ø Vdc Max.
"Off" State	1.8Ø Vdc Min.
Hysteresis	Ø.1Ø Vdc Min.
Max Input	±2ØØ Vdc on an input
Min Response Time	1.2 mSec (min. resolution = 1Ø mSec)
Min. validation time	Program selectable*: 5, 1Ø, 2Ø, or 32Ø mSec
Normal polarity	Individual inputs selectable to be normally open (off) or normally closed (on)
Elapsed or accumulated time	Individual inputs selectable to accumulated time in Alarm or Normal

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Table 1. 626-PA-6011 Technical Specifications (Cont.)

System Check	Temporarily disables externally applied inputs and causes all inputs to change states twice, checking input amplifiers, debounce filters, change of state logic and interrupt logic. Faulty inputs produce fault messages indicating faulty circuits.
Printout Modes	Printout
Normal	Channel No., input No., present state and time, plus accumulated time (where appropriate)
Maximum Detail	Same as NORMAL
Daily (Data) Summary	Channel No., input No., present state, number of transitions to A or N, total time accumulated in A or N
Short Term Summary	Same as daily summary except no present state
Program Summary	Channel No., module type, minimum (debounce) time, normal polarity state and elapsed time polarity
Preset	5 mSec debounce time, all inputs N/O, accumulated alarm time.

*Jumper selectable to 40, 80, 160, or 320 mSec.

4 INSTALLATION

To install the 6011 in the mainframe, proceed as follows:

CAUTION

Be sure 626 is turned off and that all power connected to all plug-in modules is turned off.

a. Position the top and bottom front corners of the plug-in module in the upper and lower tracks at the desired slot position at the rear of the mainframe.

b. Carefully slide the module into the mainframe until it is firmly seated.

c. Tighten the top and bottom captive screws to secure the module to the mainframe.

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5 CONNECTING INPUT CHANNELS

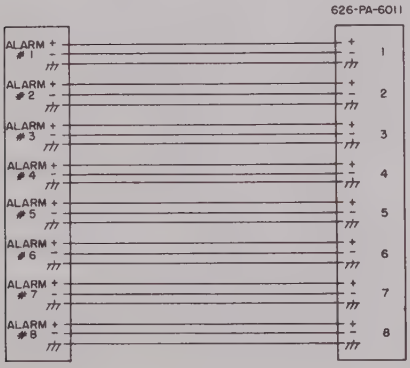
5.1 Connection Procedure

The 6011 is equipped with eight 3-pin connectors installed at the rear of the module. The input leads must be wired to the mating connectors supplied with the module, observing the polarity as marked on the rear panel. Attach each wired mating connector to the corresponding (1-8) rear panel connector.

CAUTION

To avoid damaging the equipment, do not apply DC voltages in excess of 200V to the 6011.

5.2 Circuit Applications



Connection to Backplane Alarm Signals
(No Separate Contact Supply Required)

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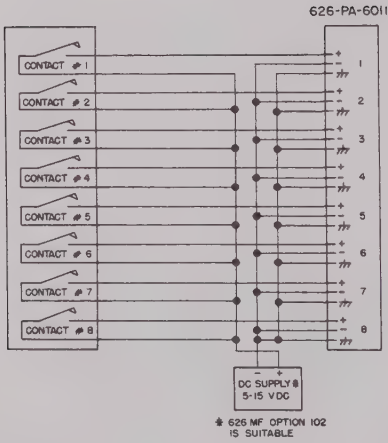

Connection to Relay Contacts (Separate Contact Supply Required)

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6 OPERATING THE 6011

6.1 Operational Description

The 6011 records and prints out any change of state of any of its eight inputs. Inputs can be programmed to be "normally closed" (or "high" or "on") or "normally open" (or "low" or "off") in accordance with the application. Minimum validation time is also program selectable to 5 mSec, 10 mSec or 320 mSec. Elapsed time is programmable to accumulate time spent in either the normal or alarm state. Both input state and validation parameters are stored in CMOS Random Access Memory so they are maintained when the 626 is turned off.

When any input changes state, the change data and alarm/normal status of all the inputs are stored, and the appropriate time accumulation action is taken. Depending on the printout mode selected, the channel number, alarm/normal status, and time of change and where appropriate, the time duration of the event are printed out. The number of transitions to the alarm state is also stored and printed out during data summary (along with present state). The total time spent in either the alarm or normal (programmed) state for that day, up until the printout time, is also printed. If a memory overflow occurs, only the transition count is updated. The transition count is stored in the short term accumulator and is printed out for those inputs that change state during the overflow condition when the overflow condition is cleared.

There are three input terminals: +, -, and GND. Since the maximum common mode voltage is ±200V DC, maximum inputs from ground are as follows:

positive input = 200 VDC, negative input = 197 VDC; or
positive input = -197 VDC, negative input = -200 VDC.

The inputs actually change state as follows:

ON = 2.30 VDC Max.
OFF = 1.80 VDC Min.
Hysteresis = 0.10 VDC Min.

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6.2 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6011 operation are described in Table 2. Figure 1 shows the typical front panel controls associated with the 6011. For a description of controls common to overall Model 626 operation, refer to Volume 1 of TM-106650U.

Table 2. 6011 Operating Controls

Item	Function
F SENS pushbutton	Used in interactive program to change minimum validation time.
SENS pushbutton	Used in interactive program to change polarity of input states.
IMP SENS pushbutton	Used in interactive program to change the ETA (Elapsed Time Accumulated) mode of the inputs.
DATA pushbutton	When depressed, produces data summary printout.

6.3 Programming Procedure

Assume that it is desired to program the eight inputs of a 6011 as follows:

Minimum Validation Time: 10 mSec

Input	1	2	3	4	5	6	7	8
Polarity	1	0	1	0	0	0	0	0
ETA Mode	1	1	0	0	1	0	1	0

where the polarity code is defined as follows:

1 = N/C or on
0 = N/O or off

and the ETA mode is defined as:

1 = Elapsed time in Alarm state, and
0 = Elapsed time in Normal state.

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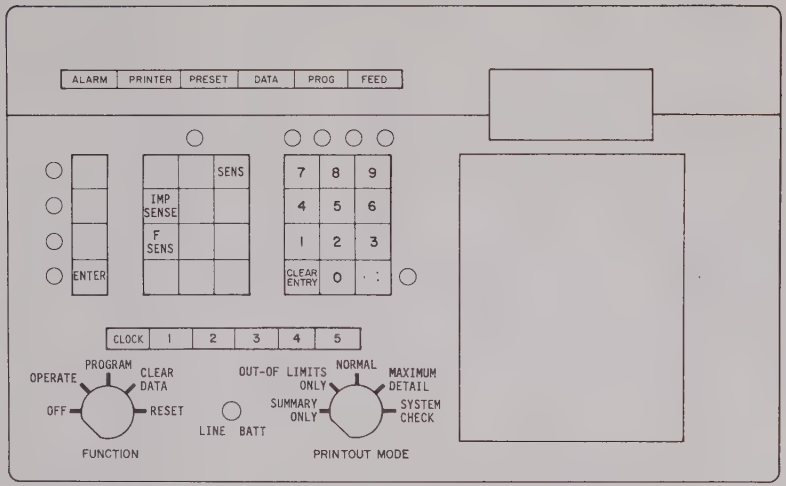

Figure 1. Typical Front Panel with 6011 Installed in Mainframe.

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Program the 6011 as follows:

a. Set the FUNCTION switch to PROGRAM and depress the pushbutton (1-5) that corresponds to the slot position of the 6011 plug-in to be programmed. As shown in the typical printout of figure 2, a program summary is printed out, followed by prompt message #1. This message permits the operator to change minimum validation time, any or all input polarities, or any or all ETA modes.

b. To reprogram minimum validation time, press the F SENS pushbutton. This causes prompt message #2 to be generated. Now press "2". Note that program summary #2 is printed with minimum time updated to 10 mSec.

c. Prompt message #1 automatically follows the updated program summary. To change polarity, press the SENS pushbutton. This causes prompt message #3 to be generated. Enter the desired polarities: 1 0 1 0 0 0 0 0.

Note that program summary #3 is printed with both minimum validation time and polarity update.

d. Prompt message #1 again follows the program summary. To change the ETA modes, depress the IMP SENS pushbutton. This causes prompt message #4 to be generated. Enter the desired ETA modes:

1 1 0 0 1 0 1 0.

Note that program summary #4 is generated, with all three programmable parameters updated as desired. Another prompt #1 message is also generated, enabling further changes to be made, if desired.

7 SELECTING THE FACTORY/OPTION 101 PRESET PROGRAM

NOTE: Custom Preset Option 101 allows the user to choose his/her own program for the PRESET function

To select the program stored in non-volatile memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. Unless specially modified to customer requirements, the factory-set program for the 6011 is as follows:

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```
TO CHANGE ETA MODE
PRESS:  'IMP SENS'
TO CHANGE POLARITY
PRESS:   'SENS'
TO CHANGE MIN TIME
PRESS:   'F SENS'

T 1 1 1 1 1 1 1 1
P Ø Ø Ø Ø Ø Ø Ø Ø
# 1 2 3 4 5 6 7 8

MIN TIME=005 MSEC

   626-PA-6011
```

(Read Up)

```
TO CHANGE ETA MODE
PRESS:   'IMP SENS'
TO CHANGE POLARITY
PRESS:   'SENS'
TO CHANGE MIN TIME
PRESS:   'F SENS'

T 1 Ø Ø 1 1 1 Ø 1
P 1 Ø 1 1 Ø 1 1 Ø
# 1 2 3 4 5 6 7 8

MIN TIME=020 MSEC

   626-PA-6011
       CH 4
PROGRAM SUMMARY

  PROGRAM MODE
```

8 DESCRIPTION OF PRINTOUTS

With the plug-in module programmed and the FUNCTION switch set to OPERATE, a change of state detected in any of the eight inputs to the 6011 produces a printout. A sample printout appears in figure 3. This readout shows inputs that were programmed to measure accumulated time while in the alarm state. Each event in the event data printout occupies three lines. In event printout #1, input 6 of channel 1 changed to the alarm state at 20:48:30.41 and remained there until 20:48:34.55. The third line (up) indicates that the Elapsed Time (ET) in the Alarm (A) state was less than Ø.1 minute. (Maximum time for the ET entry is 999.9 minutes.) Note that the Elapsed Time for input 6 appears as ØØØØ.Ø minutes in later printouts. This occurs if the inputs change at a rate faster than can be printed. In such cases, only the first elapsed time interval is shown (AET = < Ø.1 MIN); the following ET printouts are set to ØØØØ.Ø MIN.

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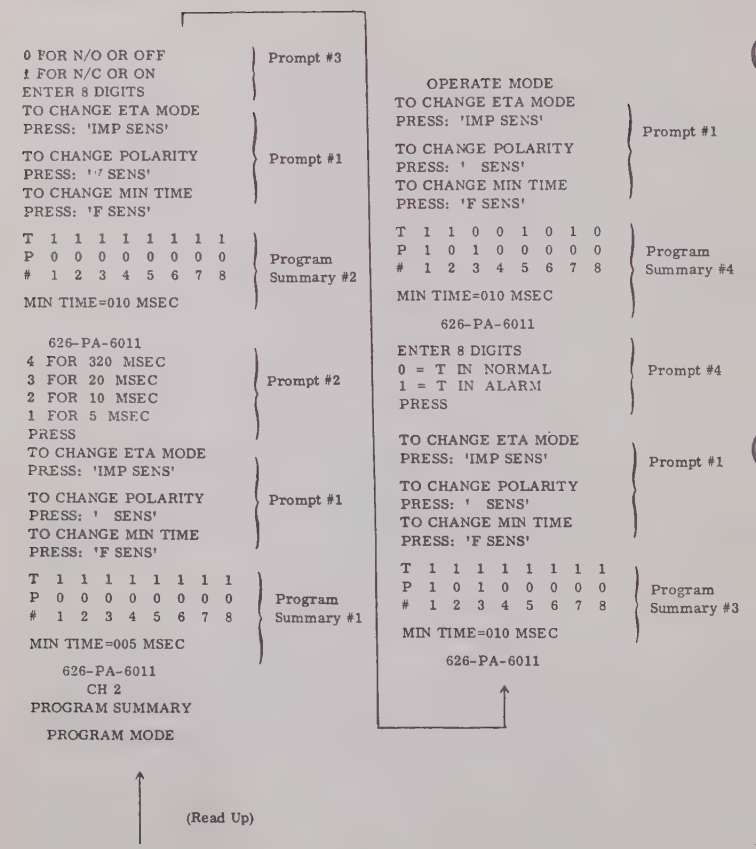

Figure 2. Typical Programming Sequence

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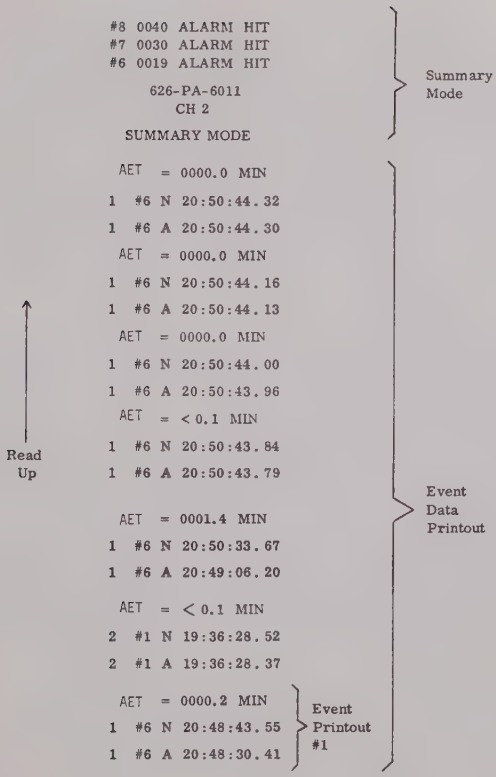

Figure 3. Event Data and Summary Mode Printouts

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If the change state activity increases to a very high level, producing a memory overflow condition, the 6011 initiates a summary mode. The summary indicates the number of alarm transitions that occurred during the overflow interval. In this case, 19, 30, and 40 alarm "hits" were detected in inputs 6, 7, and 8, respectively. Note that for this summary, only those inputs that change are printed; no activity was detected in inputs 1 through 5 of this example.

When the PRINTOUT MODE switch is set to SYSTEM CHECK, board status is checked and a system check printout is produced. (See figure 4.) If the 6011 module is determined to be good, a system check printout such as that shown is produced. If an abnormal condition is detected, the line BD OPERATIONAL may be replaced by one of the following:

INTERRUPT ERROR
INPUT ERROR
DATA ERROR

The 6011 cannot be calibrated if programmed to 320 mSec minimum validation time. Any error causes the board to be turned off until the error is corrected or the unit is reset. The DATA SUMMARY will display "BD OFF" as well as the usual message.

Note that the system check printout starts and ends with asterisks.

To obtain a program summary of the plug-ins installed in the Model 626, set the FUNCTION switch to OPERATE and depress the PROG pushbutton. The program summary for the 6011 is shown in figure 4. The summary shows the time, channel number, module type, programmed polarity, and ETA mode for each input.

The data summary is obtained by depressing the DATA pushbutton. For each input, the printout indicates the number of alarm transitions (if any) as well as the present state. (See figure 4.) The total time (TT) in the alarm state (or normal state, if so programmed) is also shown. (The maximum time possible for the TT printout is 1440 minutes (24 hours); this value is reset to 0000.0 at midnight.)

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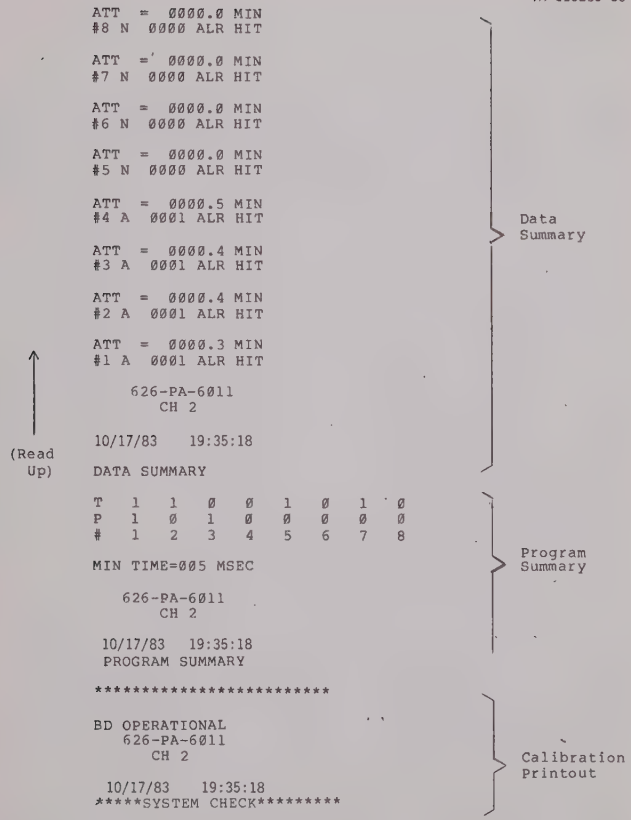

Figure 4. System Check, Program Summary and Data Summary Printouts

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9 ASSEMBLING CABLES FOR 626-PA-6011

To attach the wires to the pins provided in the accessory bag for use with the 626-PA-6011, AMP tool #90325-1 is recommended. If this tool is not available, the following procedure may be used instead.

1) Take the three conductor twisted pair of red, green and black 24 AWG wires and untwist the 2 inches at one end.

2) Strip the insulation back 1/2" ± 1/16" and tin the wires.

3) Insert the wire into the pin until 1/8" of insulation is touching the pin (so edge of insulation is even with the first outer set of tabs). Bend these tabs tightly over the insulated wire, one at a time, with a needle-nose pliers.

4) Bend the inner tabs tightly over the stripped wire, one at a time, with a needle-nose pliers.

5) Apply a soldering iron to the inner tab. After heating for several seconds, apply a small amount of rosin core solder to the point of contact. Let flow for several seconds and remove soldering iron. Do not heat too long or the insulation may melt.

6) Repeat for the remaining 2 wires in the group.

7) When the pin has cooled, insert the pins into the connectors provided as follows, until a click is felt.

a. Red wire into hole marked #1.
b. Black wire into hole marked #2.
c. Green wire into hole marked #3.

10 STANDARD ACCESSORIES

Model #	Part #	Quantity	Description
626-PA-6011	TM-110280-3U	1	Operating Manual
	AMP 1-350352-9	8	Connector Housing
	AMP 640545-1	24	Connector Pin
	110289	1	Instruction Decal

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11 626 MODULE CAPACITY

The 626 standard mainframe has an upper limit of the total load rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Rating
626-PA-6001	2 Units
626-PA-6001 with Extra Option Board	3 Units
626-PA-6002	2 Units
626-PA-6003	4 Units
626-PA-6006	2 Units
626-PA-6007	1 Unit
626-PA-6011	1 Unit
626-PA-6012	3 Units
626-PA-6014	1 Unit
626-PA-6015	4 Units

When selecting modules for installation in any mainframe, simply verify that the sum of the load ratings of the installed modules does not exceed 20.

12 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Technologies Customer Service Department and obtain an Authorization Number.

   Phone No: 201-287-3680; TWX 710-997-9553

2. Fill out the Repair/Service Order enclosed in this manual and ship it with the equipment to the Customer Service Department.

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-111026U

VOLUME 1

OPERATOR'S MANUAL

626-PA-6014

8-CHANNEL TEMPERATURE MONITOR

NOTE

Refer to Volume 2 (Service Manual) of TM-111026U for maintenance data.

1 May 1984
(Revised 1 July 1984)

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DRANETZ

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626-PA-6014 8-CHANNEL TEMPERATURE MONITOR

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626-PA-6014 8-CHANNEL TEMPERATURE MONITOR

1 INTRODUCTION

This manual provides operating instructions for the 626-PA-6014 and 626-PA-6014A 8-Channel Temperature Monitor Plug-ins, hereinafter referred to as the 6014. The 6014 is equipped with eight temperature probes; no probes are supplied with the 6014A. Probes (P/N 111059) may be ordered separately. Since the two plug-ins operate identically, both are referred henceforth as the 6014. The 6014 is designed for installation in the Model 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in TM-106650U.

2 PURPOSE

The 6014 is an 8-input module which monitors temperature from -50 to 150 degrees C. With thresholds programmed by the user, the 6014 stores, analyzes, classifies and prints out quantitative and qualitative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The 6014 monitors changes in any of these parameters, based on user programmable sensitivities, and high and low limits. Each input takes four readings over a 2.5 second period and then averages the readings to determine if a threshold or limit crossing has occurred. The sensitivity value of each type of disturbance, above which detection and printout occurs, is operator programmable. Except for an automatic summary printout at the end of each day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance summmary printout occurs only at the end of each day. This feature permits long term unattended operation.

The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

3 EQUIPMENT CHARACTERISTICS

The 6014 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in any one of the five slots of the Model 626 Universal Disturbance Analyzer. Technical specifications of the 6014 are listed in Table 1.

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Table 1. 626-PA-6014 Specifications

Input Specification	
Temperature Range:	-50 to +150 deg C
Accuracy	+/- 2 deg C from 0 to 100 deg C +/- 3 deg C otherwise
Cable Length:	100 ft. max (30.5 m)
Cable Temperature:	200 deg C max
Programmable Parameters	
Temperature	
Low Limit:	0 deg.C min (-50 deg C via Preset)
High Limit:	150 deg C max
Sensitivity:	1 deg C min
Preset to:	LO=20, HI=30, SENS=2

4 INSTALLATION

CAUTION

Be sure 626 is turned off and that all power connected to all plug-in modules is off.

To install the 6014 in the mainframe, proceed as follows:

a. Position the top and bottom front corners of the plug-in module in the upper and lower tracks at the desired slot position at the rear of the mainframe.

b. Carefully slide the module into the mainframe until it is firmly seated.

c. Tighten the top and bottom captive screws to secure the module to the mainframe.

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5 CONNECTING THE SENSOR PROBES TO THE MODULE

CAUTION: To avoid damaging the equipment, do NOT connect or disconnect the probes while the 626 is turned on.

5.1 Connection Procedure

The 6014 is supplied with eight connectors on the rear panel. Proceed as follows:

a. Insert key in FUNCTION key switch on the front panel of the mainframe and set switch to OFF position.

b. Connect the sensor plugs (1-8) to the rear panel connectors.

5.2 Applications

Probes: The individual sensors may be clipped or taped in place. Tie wraps with eyelets are included for this purpose.

The cables may be extended up to 100' total by the use of the optional extension P/N 111056-G2.

Uses:
1. Within the computer room, distribute probes so as to pick up temperature shifts which may be caused by blocked air handling ducts.
2. Within a system cabinet, locate the probes so as to record "hot spots" which may arise, due to poor air circulation, failed or over stressed assemblies, etc.

6 OPERATING THE 6014

6.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with the 6014 are described in Table 2. Figure 1 shows the typical front panel controls associated with a 6014 on a Model 626. For a description of controls common to overall Model 626 operation, refer to Volume 1 of TM-106650U.

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Table 2. 6014 Operating Controls

Item	Function
INPUT pushbutton	Used to initiate channel input programming.
LO LIMIT pushbutton	When depressed, enables the numeric keyboard to program low limit for any temperature input.
SENS pushbutton	When depressed, enables numeric keyboard to program sensitivity for any input.
NUMERIC pushbuttons	When single lamp lights, user is cued to press a "1" to "8" for temperature inputs A to H, respectively. Also used to enter numerical values for other functions.
ENTER pushbutton	When depressed, transfers numeric keyboard values into 6014 memory for processing.
DATA pushbutton	When depressed, outputs data summary.
PROG pushbutton	When depressed, outputs program summary.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that input.
HI LIMIT pushbutton	When depressed, enables the numeric keyboard to program high limit for any temperature input.

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Figure 1. Typical Front Panel with 6014 Installed in Mainframe

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6.2 Programming Procedure

Assume it is desired to program Channel B for a temperature high limit of 35 deg C, a low limit of 15 deg C, and a sensitivity of 3 deg C.

For the example cited, program the 6014 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that the red LED next to the INPUT pushbutton is lit. Pushbutton must then be pressed. Note that the following prompt message is printed and a single yellow LED is lit.

INPUTS A - H
ENTER: 1 - 8 FOR ↑ (read up)

d. Depress a "1" thru "8", depending on which input you wish to change.

Note that the green LED adjacent to the ENTER key is lit, waiting for the ENTER key to be depressed.

(assume a "2" was depressed for the following example)

e. When the ENTER indicator goes out, an indicator above the center bank of pushbuttons lights. This indicates that one of the functions (HI LIMIT, LO LIMIT, SENSITIVITY) may now be programmed. At this time the PRESET button could also be depressed to change all of the parameters for all eight temperature inputs to factory-preset values.

NOTE: Custom Preset Option 101 allows the user to choose his/her own program setup for the PRESET function.

f. Depress the HI LIMIT pushbutton.

g. Note that three yellow LEDS above the numeric keyboard are now lit. Enter 035, using the keyboard. If an error is made, depress CLEAR ENTRY and then the correct entry. Note that the leading zero for numbers less than 100 must be entered.

h. When the value is entered, the lamp next to the ENTER pushbutton lights. Depress this pushbutton to enter the value.

i. Repeat steps c through h for the low limit value (015), using the LO LIMIT pushbutton.

j. Repeat steps c through h for the sensitivity value (03), using the SENS pushbutton. Note that only two yellow LEDS light in step g.

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k. The same sequence is used to change any temperature input, provided that the appropriate number is entered in step c.

l. The completed program printout should take the following form:

```
HIGH LIMIT Ø7Ø
LOW LIMIT Ø3Ø
SENS Ø1Ø
   INPUT H
HIGH LIMIT Ø55
LOW LIMIT Ø35
SENS Ø15
   INPUT G
HIGH LIMIT Ø35
LOW LIMIT Ø15
SENS ØØ3
   INPUT F
HIGH LIMIT Ø75
LOW LIMIT Ø35
SENS Ø1Ø
   INPUT E
HIGH LIMIT Ø44
LOW LIMIT ØØ5
SENS ØØ3
        *
        *
        *
        *
        *
HIGH LIMIT Ø35
LOW LIMIT Ø15
SENS ØØ3
   INPUT B
HIGH LIMIT 13Ø
LOW LIMIT ØØ5
SENS Ø3Ø
   INPUT A
```

(read up)

626-PA-6014
CH2

PROGRAM SUMMARY

NOTE

The instrument is designed to detect an invalid entry. For example, if the high limit value is selected as 3Ø deg C, and the user selects a low limit value of 35 deg C, the following printout will appear.

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```
HI LIMIT Ø36
LO LIMIT Ø35
```

m. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he (she) may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program currently in effect may be obtained by simply depressing the PROG pushbutton.

7 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6014, it is recorded and displayed in characteristic manner.

7.1 Over Limit for Temperature

An over limit condition exists when the monitored average value of temperature exceeds the user-specified upper limit for the respective input. An over limit condition is indicated by a printout such as the following:

```
4B HI 10:47:12.98
      or
4F HI 10:47:Ø9.76
```

where the 4 is the channel number, the B is for temperature input B (or 2), the F is for temperature input F (or 6) and the time is given in hours, minutes and seconds (to Ø.Ø1 sec resolution).

When the temperature recovers to normal, a printout such as the following occurs:

```
4B NOR 10:55:13.77
   Ø73.3 DEG C MAX
      or
4F NOR 11:12:34.21
   Ø65.5 DEG C MAX
```

indicating when the normal temperature was restored and the value of the highest temperature reached during the over limit interval.

7.2 Under Limit for Temperature

An under limit condition exists when the monitored temperature goes below the user-specified lower limit. An under limit condition is indicated by a printout such as the following:

```
4A LO 13:33:23.78
      or
4D LO 12:59:ØØ.Ø1
```

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When the temperature returns to normal, a message such as the following is printed:

```
4A NOR 13:44:56.98
   ØØ3.1 DEG C MIN
        or
4D NOR 12:59:58.99
   Ø24.2 DEG C MIN
```

indicating when the normal condition was restored and the value of the lowest temperature reached during the under limit interval.

7.3 Temperature Change

A temperature printout is triggered when the temperature changes more than a preselected amount from the last printed value. The change sensitivity is a user programmable value, which is selected independently for each temperature input. The following example shows several temperature input changes.

Printout	Remarks
2C DEC Ø1:22:34.76 Ø13.3 DEG C	Temperature decreased to 13.3 deg C on input C at the time shown
2E INC Ø1:23:55.32 Ø87.3 DEG C	Temperature increased to 87.3 deg C on input E at the time shown

The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in Channel 2 and that the limits for Channel 2 were programmed as follows:

```
Input A LOW LIMIT      25 DEG C
Input A HIGH LIMIT     55 DEG C
Input A SENSITIVITY    Ø5 DEG C
```

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered by depressing the DATA button. The following is an example of a DATA summary:

```
MAX  +Ø85.6 DEG C        max temperature for day
HIGH  ØØØ HT           number of high excursions
MIN  -Ø44.8 DEG C        min temperature for day
LOW   Ø12 HT           number of low excursions
PRES= +Ø19.6 DEG C       present temperature
    INPUT H
MAX  +Ø76.8 DEG C
```

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```
HIGH  ØØ1 HT
MIN  +Ø34.Ø DEG C
LOW  ØØØ HT
MAX  +134.9 DEG C
HIGH  ØØ3 HT
MIN  -Ø48.9  DEG C
LOW  ØØ3 HT
PRES= +Ø45.5 DEG C
     INPUT A

 626-PA-6Ø14
    CH2
1Ø/14/83   1Ø:48:15
  DATA SUMMARY


2A NOR 12:56.38.51
   Ø78.2 DEG C

2A HI 12:56:34.52


2A NOR Ø3:55:45.98
   Ø13.5 DEG C

2H INC Ø3:53:34.89
   Ø24.8 DEG C

2A INC Ø3:5Ø:57.67
   Ø19.3 DEG C

2A DEC Ø3:4Ø.11.23
   Ø13.5 DEG C

2A DEC Ø3:39:45.33
   Ø21.1 DEG C


2A LO Ø3:39:45.33
```

(Read Up)

Printout of over limit in OUT-OF-LIMITS ONLY mode

Printout of under limit in NORMAL mode.

(Read up)

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8 SYSTEM CHECK

When the PRINTOUT mode switch is set to SYSTEM CHECK, the precision reference signals are applied to the measuring circuitry. The probe inputs are disconnected during this time. These signals verify the functionality of the module, but not the actual sensors. The sensors can be checked by the use of a calibrated standard (a precise temperature chamber). The allowable tolerance levels are described below, along with a sample printout:

```
*********************

       V3=000.0          +  0.2
       V2=010.2          +/-0.3
       V1=091.9          +/-0.6

     626-PA-6014
        CH2

10/17/83   12:34:56.78
  ***SYSTEM CHECK***

*********************
```

9 SHORT TERM ACCUMULATOR

If disturbances should take place at a rate faster than the 626 mainframe can process and print them out, and the internal event stack memory should overflow, then subsequent events are stored in summary form in the Short Term Accumulators (until the overflow condition is cleared). These values are cleared out after the printout of the Short Term Accumulators is complete. The format is identical to the Data Summary except the values are printed out only when a HI or LO limit is crossed to expedite the printing.

10 626 MODULE CAPACITY

The 626 standard mainframe has an upper limit of the total load rating of the installed modules. The overall mainframe capacityis is set at 20 units, and individual modules have load ratings as follows:

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Plug-in	Load Rating
626-PA-6001	2 Units
626-PA-6001 With Extra Option Board	3 Units
626-PA-6002	2 Units
626-PA-6003	4 Units
626-PA-6006	2 Units
626-PA-6007	1 Unit
626-PA-6008	2 Units
626-PA-6009	4 Units
626-PA-6011	1 Unit
626-PA-6012	3 Units
626-PA-6014	1 Unit
626-PA-6015	4 Units

When selecting modules for installation in any mainframe, simply verify that the sum of the load ratings of the installed modules does not exceed 20.

11 STANDARD ACCESSORIES

Part No.	Quan.	Description
111059	8	Temperature Probe
TM 111026U	1	Operator's Manual

12 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Technologies Customer Service Department and obtain an Authorizartion Number:

   Phone: 201-287-3680; TWX: 710-997-9553

2. Fill out the Repair/Service Order enclosed in this manual and ship it with the equipment to the Customer Service Department.

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